NOVEMBER
1959

FOUNDRY

A PENTON PUBLICATION

Ultra-High Strength Steel Castings —p. 30

- Determining Requirements of Risers —p. 74
- Sand Segregation and Casting Quality —p. 86
- How To Use a Management Consultant —p. 95

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Circle 551 on Page 53

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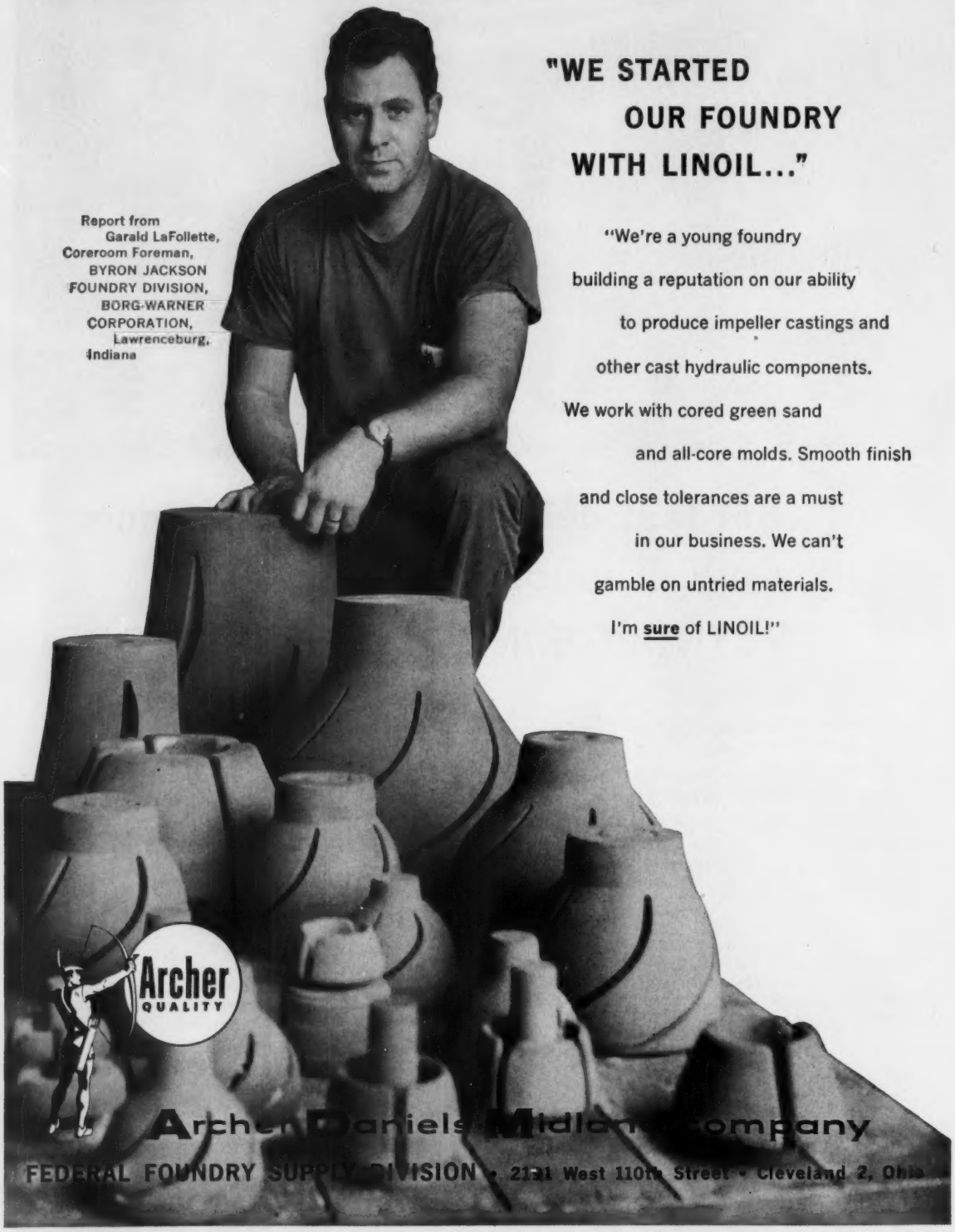

Report from
Garald LaFollette,
Coreroom Foreman,
BYRON JACKSON
FOUNDRY DIVISION,
BORG-WARNER
CORPORATION,
Lawrenceburg,
Indiana

"WE STARTED OUR FOUNDRY WITH LINOIL..."

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These combination barrel and crankcase cores are used in casting engine blocks at Ford's Cleveland Foundry for the new Falcon car. The cores are hollow and made of resin-bonded sand. For details, see Page 82.

November 1959
Volume 87—Number 11

FOUNDRY
A PENTON PUBLICATION

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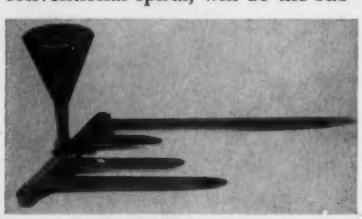
FOUNDRY is edited primarily for management, production, technical, and purchasing personnel in foundries. A copy is sent at no cost to each metal casting plant in the U. S. and Canada employing 20 or more workers and to selected smaller foundries. Additional copies are sent to each foundry to the extent necessary to serve all key foundry personnel on a personal or routed basis. A limited number of copies is supplied at no cost to educational institutions. Subscriptions in the U. S., possessions, and Canada for home-addressed copies and copies not qualified for under the above principles: One year, $10. Single copy, $1. Other countries: One year, $20. Single copy, $2. Published monthly and copyright 1959 by The Penton Publishing Co., Penton Building, Cleveland 13, Ohio. Accepted as controlled circulation publication at Cleveland, Ohio.

THE EDITORS' WORKSHOP

ENGINEERED PARTS: The modern concept of developing an engineered cast part instead of merely producing a casting is typified by operations of Oberdorfer Foundries Inc., Syracuse, N. Y. Its practices

will be described next month. In addition to its engineering facilities, Oberdorfer offers a customer a choice of four molding methods, and operates patternmaking, heat treating, and finish machining departments.

FLUIDITY: Some British investigations of metal fluidity, involving a different test piece design than the conventional spiral, will be the sub-



ject of one of December's feature articles. The author, Dr. V. Kondic, believes that the concept of fluidity and the term itself should be broadened from the viewpoint of terminology and test methods.

TO COME: Our new series of articles on gating and risering will start, with the December issue, the discussion of practice for specific metals. General principles were covered in the first two installments. Next month's article, prepared by R. W. Ruddle, will treat the gating and feeding of copper-base alloy castings.

Another December feature will be a discussion of the investment shell process.

Report from
Paul Wilson, Core-
room Foreman,
FRANK FOUNDRIES
CORPORATION,
Muncie, Indiana

"I run the core room in the Muncie foundry . . . turn out 60 tons of cores a day. They range from little ram-up jobs to 17-piece assemblies for transmission cases. It's a real headache if the core oil acts up . . . makes the difference between profit and loss. For a reliable oil . . .

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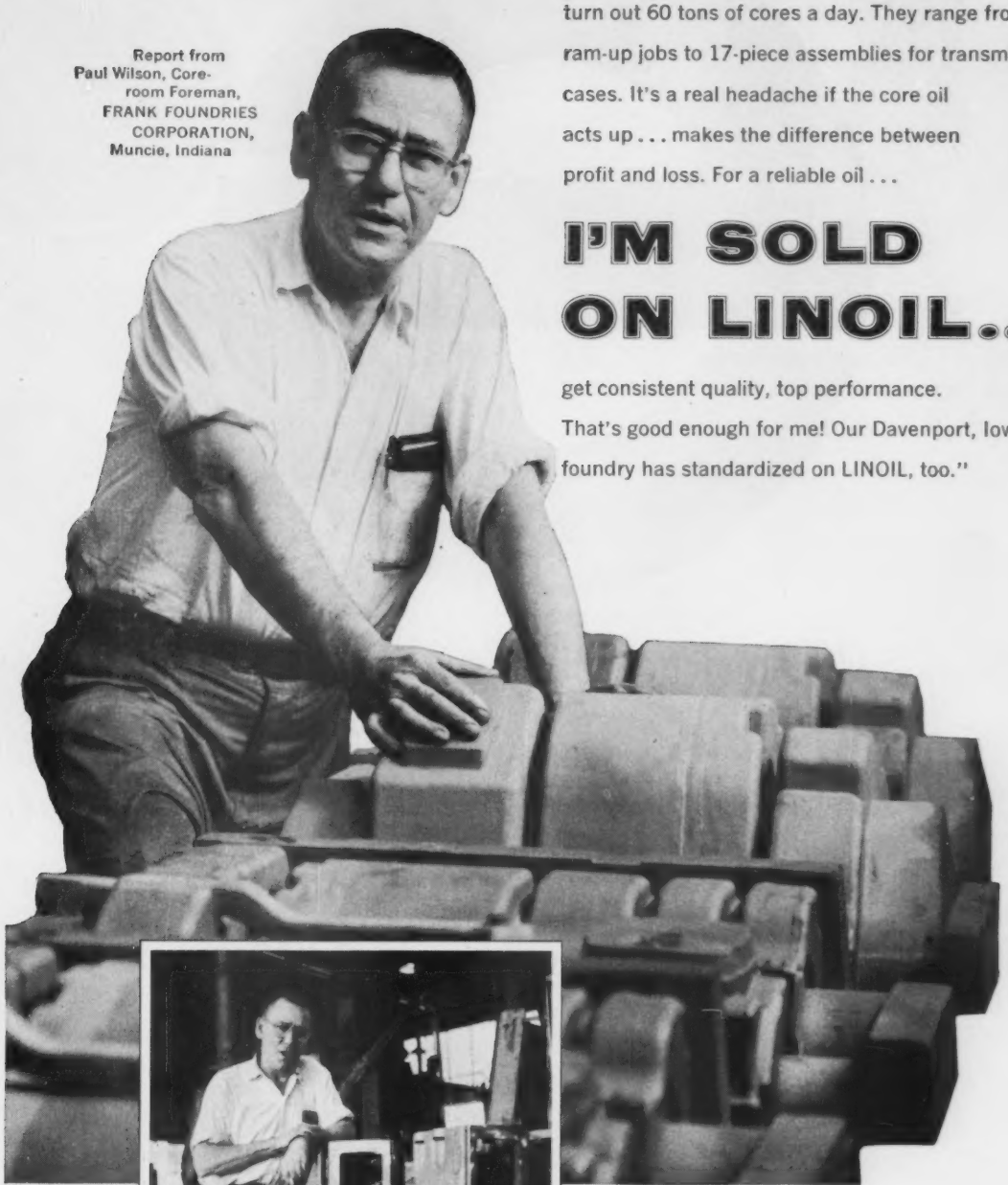

"We can't risk quality on these costly transmission housings. Notice the intricate core work inside . . . reason enough to be fussy about my core oil."

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Circle 556 on Page 53

The Shalco Corporation, pioneers in Shell Core Blowers and Shell Molding Machines, joins forces and becomes a Division of the National Acme Company, pioneers in automatic multiple-spindle bar and chucking machines

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Our "Zone of Responsibility" to the metalworking industry is constantly being broadened to include almost every production step from raw material to the finished product. In joining forces with National Acme, Shalco's exclusive developments and broad experience in the art of shell molding is combined with 75 years' experience in automatic machine tool manufacturing and servicing. The result is shell molding equipment built to the highest standards of machine tool precision and reliability.

Shalco's unique design and manufacturing techniques have resulted in low cost, greatly simplified Shell Core Blowers and Shell Molding Machines with unusual flexibility. We believe this outstanding equipment will now allow the Foundry Industry to take greater advantage of the economy, precision and high quality realized with shell molded castings.

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T. L. Stemple

President
The National Acme Company

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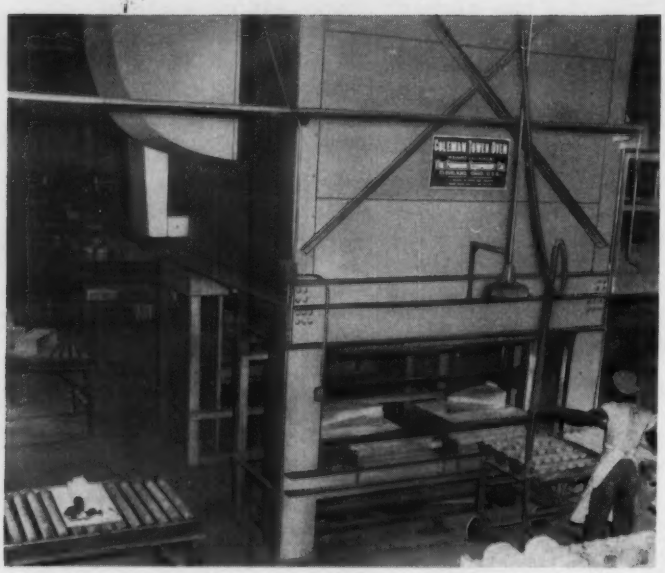
Coleman Dielectric Core Oven in leading plumbing fixture foundry. Direct labor alone reduced by 75%, with many other important savings and advantages.



One of two large Coleman Tower® Core Ovens in a major steel foundry baking cores up to 150 pounds. Self-amortizing investment . . . ovens paid for themselves out of direct annual savings in less than two years.

● Performance records in all types of foundries prove that Coleman Conveyor Core Ovens reduce core department costs by as much as 50%.

Coleman Ovens quickly pay for themselves out of direct savings in labor, materials and reduced casting scrap.

As builders of the world's only complete line of foundry ovens . . . dielectric or recirculating heat . . . we can recommend, without bias, the right oven for your particular needs.

WRITE FOR BULLETIN 54

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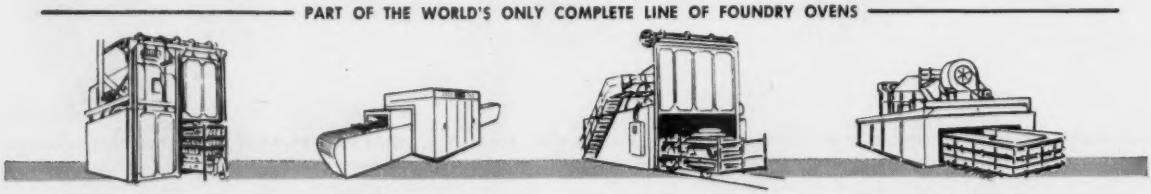

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because it's more maneuverable

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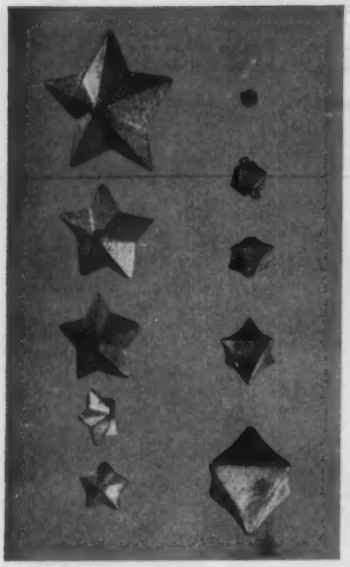

Foundrymen have discovered
once they try

ABMET CLEANING STARS

they won't use anything else . . . not even their own!

For more than thirty large American foundries, Abmet cleaning stars mean substantial savings in cleaning costs. Abmet's abrasive-resistant qualities are many times higher than ordinary chilled or hard iron cleaning stars, and Abmet's Brinell hardness of 440 from surface to core assures sharp cleaning edges, longer life, more uniform cleaning ability and greatly reduced milling time. Replacements become much less frequent. That's why more foundries are giving up casting their own cleaning stars.

If you are wasting costly time, effort and material casting stars, you can save up to 500 percent in cleaning star costs by switching to Abmet.

Once you have cleaned castings with Abmet stars YOU WON'T USE ANYTHING ELSE!

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QUINCY, OHIO

Circle 560 on Page 53

With the Editors

SO MANY MEETINGS: Fall is one of the two major meeting periods in the foundry industry, and a time that tests the vigor and endurance of the editors. Meetings on a national scale, regional foundry conferences, and chapter meetings are some of the foundry gatherings that must be attended and reports written for presentation in FOUNDRY.

For example, since the middle of September, our editors have or will cover annual, fall or industry meetings of the American Die Casting Institute, Malleable Founders' Society; Steel Founders' Society of America; Gray Iron Founders' Society; Foundry Equipment Manufacturers' Association; Cast Bronze Bearing Institute; Non-Ferrous Founders' Society; Investment Casting Institute, and the National Foundry Association.

We are covering regional foundry conferences at Rolla, Mo.; Syracuse, N. Y.; Seattle; Grand Rapids, Mich.; Boston; Columbus, Ohio; Lafayette, Ind.; and New York.

In the meantime, the editors visited a number of plants to obtain data and photographs for articles to appear in FOUNDRY during the coming months.

We hope all of this activity will produce copy that will serve you well in operating your business.

—o—

Congratulations: To the *Brillion Chatter* published by the Brillion Iron Works, Brillion, Wis., to Doug Rulseh, editor, and Oliver C. Wardwell, director of personnel and public relations. For the second time in three years, that publication has won first place in a contest sponsored among company publications by the Wisconsin Manufacturers' Association, the University of Wisconsin, and the Wisconsin Industrial Editors Association. The *Chatter* placed first in 1957 and second in 1958.

—o—

One of the Oldest: Earlier this year, G. Clymer Brooke, president, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., addressed the 253rd Benjamin Franklin Birthday Dinner of the Newcomen Society of North America in Philadelphia. The address on "Birdsboro, Company with a Past Built to Last," has been prepared in booklet form.

It is an interesting story, well told, of a company organized in 1740, and the changes that have taken place since that time, especially the contributions to the nation in time of war. Mr. Brooke's family first made its appearance in the American iron making industry in 1796, when Matthew Brooke, his great grandfather, joined the organization. In 1809, Matthew acquired the entire company.

—o—

U.S.A.F. Plaque: A beautiful cast chromium-nickel stainless steel plaque is mounted at the entrance of the United States Air Force Academy, Colorado Springs, Colorado.

The casting was produced by Midwest Alloys Inc., 45 Hunter St., St. Louis 24. It is 18 in. in diameter, 1½ in. thick, and is ACI Type CF-8 stainless steel (20 per cent chromium, 10 per cent nickel). The accompanying photograph and information originally appeared in "INCO Nickel Topics" of International Nickel Co.

—o—

What Is a Casting? The following "*daffy-nitions*," used one time by F. Kermit Donaldson, executive vice president, Steel Founders' Society of America, to introduce a talk, stand alongside the "Faked Foundry Facts" that ran for years in FOUNDRY:

Castings: A term loosely applied to parts made by letting metal solidify tightly in a mold; the basis of a

...OR SMALL

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INTERNATIONAL MOLDING MACHINE COMPANY

LA GRANGE PARK, ILLINOIS

The International Line is designed by experienced foundry engineers who have a practical working knowledge of the problems of the industry.

"There is an INTERNATIONAL for Every Type of Job"

Circle 561 on Page 53

Foundry Proved for Maximum Efficiency!

HAUSFELD TILTING CRUCIBLE FURNACES

- trouble-free tilt . . . *holds* in any position
- heavy duty cast iron trunnions surrounded by roller bearings
- precision-machined throughout
- arrives factory-assembled, factory-tested to operating temperature
- exclusive Hausfeld swing-top compensates for various size top covers

With crucible sizes from #40 to #400, there is a Hausfeld Tilting Furnace to help you boost your plant's efficiency. Write for full details today.

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CAMPBELL-HAUSFELD
METAL MELTING FURNACES

long-standing feud between two groups known as designers and foundrymen.

And what is a foundryman? Well, so the daffy version goes . . .

A *Foundryman* is an unhappy citizen who continually seeks additional work, even though his costs often exceed his price, and his plant is partly shut down for repairs; or, accordir.g to some designers, one who gropes or founders.

And the *Designer?* . . . He is described as a man with ideas, who refuses to let production realities defeat them; (2) one who places meaningless words on engineering drawings; and (3) an engineer disguised as a prima donna.

As for the *Engineer*: He's an underpaid, poorly dressed, ill-spoken, socially frowned-on character without whom nothing of material importance could be accomplished today . . . and . . .

The *Metallurgist*: A technological sport, produced by crossing a physical chemist with a mechanical engineer; a man employed to reconcile the conflicting errors of designers and production men; one who attempts to define the word "hardenability" . . . and sometimes asserts responsibility for . . .

Quality: A universal subject of conversation, but little action; usually preceded by definitive terms . . . such as *low* (meaning, "send it back"); *aircraft* ("double the price"); *competitive* — ("overvalued scrap"); et cetera.

Then, too, in this left-handed lexicon, there is . . .

The *Reliable Source* — Who's merely the fellow you just met . . . and the *Expert* who is just an ordinary guy more than 50 miles from home—as aren't we all today?

—o—

Why Do It? Title of a recent technical report of the U. S. Department of Commerce is: "Designing Joints for High Temperature Creep Conditions." Better stay away from such places.

—o—

Just a Bit: Under the heading "Steelworkers Seized in Theft of Iron," the Chicago *Tribune* for Aug. 9 presented this lead paragraph: "Three steelworkers were held by East Chicago police Saturday for allegedly stealing iron with the aid of a motor-powered rubber commando raft." When seized, the raft carried 1 ton of pig iron.

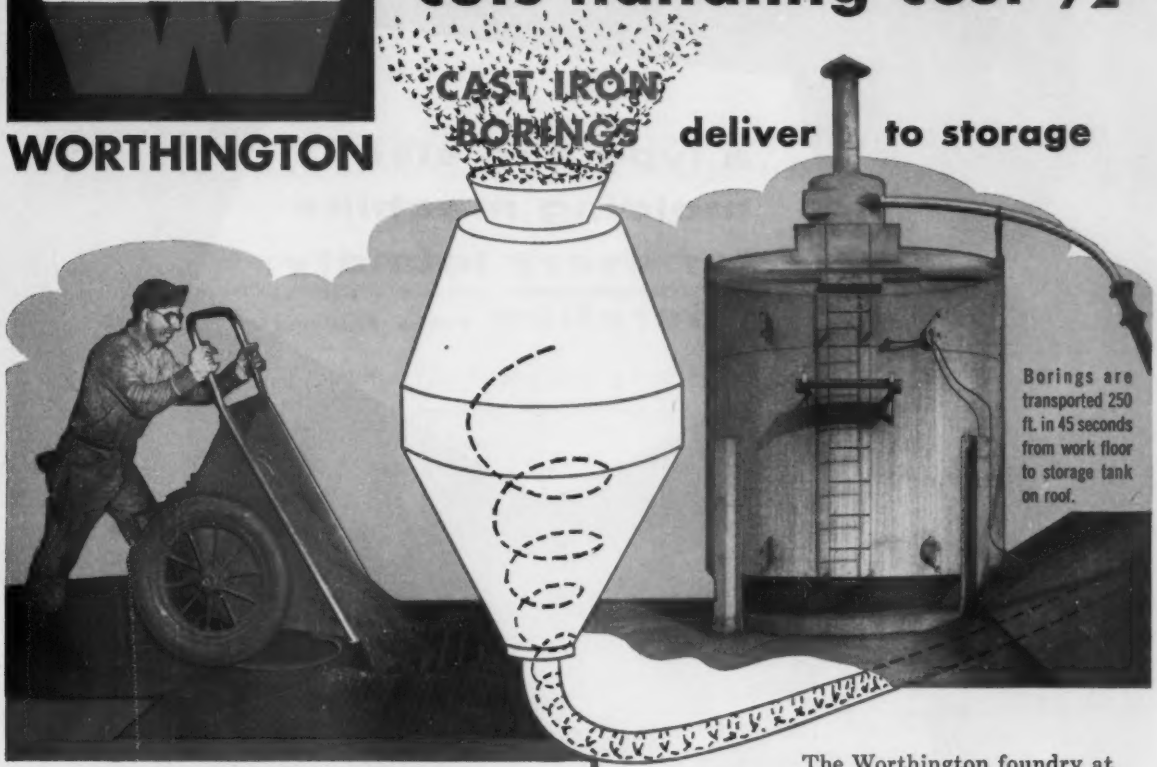
Editor Erle F. Ross of our Chicago office asks if this is not stretching things a bit.

F.G.S.

Circle 562 on Page 53

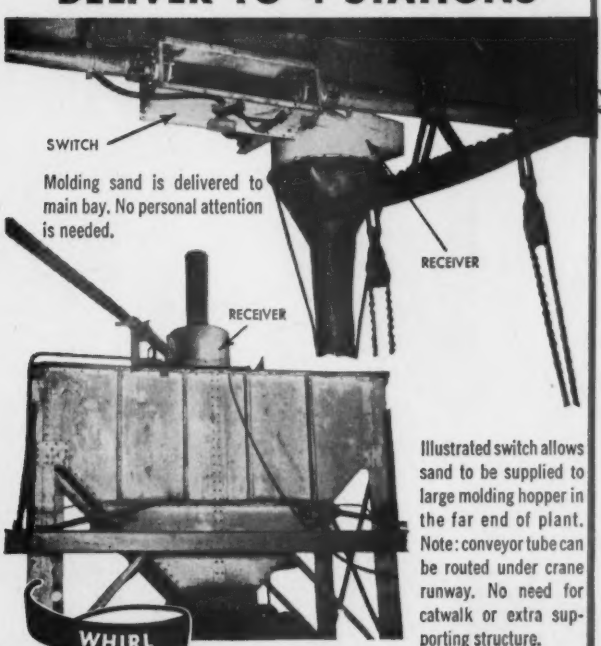
WORTHINGTON cuts handling cost ½

CAST IRON BORINGS deliver to storage



FOUNDRY SANDS DELIVER TO 4 STATIONS

The Worthington foundry at Oil City, Pennsylvania transports borings to a storage tank located on the roof with minimum labor and maintenance costs. Borings are gathered and dumped through floor grating to transporter. No other handling is involved. Foundry sands are delivered to anyone of 4 stations as needed by the use of Whirl Air Flow transfer switches that direct sand flow through overhead tubes. Production delays caused by sand shortage has been entirely eliminated at the Worthington foundry since Whirl Air Flow was installed.



Illustrated switch allows sand to be supplied to large molding hopper in the far end of plant. Note: conveyor tube can be routed under crane runway. No need for catwalk or extra supporting structure.

Maintenance work on the system is negligible and most important, direct material handling costs are reduced by ½ at this Worthington foundry. Cost of installing Whirl Air Flow is much lower than you would imagine. Just let us estimate a Whirl Air Flow system to fit your foundry need.

***WRITE TODAY**—an engineer will show you how a Whirl Air Flow system will save you money.*

WHIRL AIR FLOW PNEUMATIC CONVEYORS

WHIRL-AIR-FLOW

652 [illegible] Minneapolis [illegible] Minnesota

Circle 563 on Page 53

a type and size molding machine for every foundry operation . . . .

Over the years Herman people have consistently maintained a point of view toward casting problems which is focused on two basic elements: 1) Efficient, cost-saving production. 2) High quality.

This philosophy has stimulated a series of progressive molding machine developments which provide foundrymen with a central source for all types of machines . . . 15 different kinds, to be exact.

The Herman Vertical Hydro-Centrifugal Casting machine shown here is an example. Because of its hydraulic powering, this machine gives you tremendous versatility under various operating conditions.

These machines are, like all Hermans, rugged and dependable.

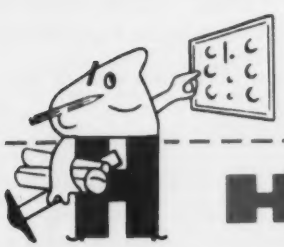
From a single control for starting, braking, stopping and reversing . . . to smooth, stepless variance of table speeds; from mechanical lubrication . . . to a remotely installed power unit for maximum protection; completely enclosed wearing parts . . . these and other operating features of this particular Herman machine are designed with quality and efficiency in mind.

This typifies the Herman development engineers approach to casting problems.

Whether you need a manual, push-button or automatic molding machine, you can turn to the address below with complete confidence that one is available to fit *your* unique casting requirements.

Why not look into this today?

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH 22, PA.



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Best Known Name in Engineered Molding Machines

Circle 564 on Page 53

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CORE VENTS

Will Not Clog . . .
Leaves No Mark!

Krauss Core Vents are knurled on sides to assure greater gripping power.
Underface — reinforcing rings prevent slots from closing when core vents are hammered into place.

Because the slots are *always open,* cores are harder packed, with no air cushions to cause soft spots. Krauss Taper Slot Core Vents eliminate clogging . . . which means less frequent cleaning. This results in less down time — greater production time. Mail coupon for prices.

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FOUNDRY _____

CITY _____ STATE _____

CALENDAR of Meetings

Nov. 2-6—American Society for Metals, National Metal Exposition & Congress, International Amphitheatre, Chicago.

Nov. 3-4—Investment Casting Institute, annual meeting, La Salle Hotel, Chicago.

Nov. 5-6—National Foundry Association, annual meeting, Hotel Roosevelt, New York.

Nov. 5-7—Metal Treating Institute, annual meeting, Sheraton Towers Hotel, Chicago.

Nov. 9-11—Steel Founders' Society of America, Technical & Operating Conference, Carter Hotel, Cleveland.

Nov. 9-11—Plumbing Brass Institute, annual meeting, Barbizon Plaza Hotel, New York.

Nov. 17-21—East Coast Regional Foundry Conference, Statler-Hilton Hotel, New York

Dec. 2 — Electric Overhead Crane Institute, annual meeting, Carlton House, Pittsburgh.

Dec. 2-4—Metallurgical Society, American Institute of Mining, Metallurgical, and Petroleum Engineers, Electric Furnace Conference, Hotel Sheraton-Cleveland, Cleveland.

Dec. 13-16—Material Handling Institute Inc., annual meeting, Savoy-Hilton Hotel, New York.

1960

Jan. 15—Malleable Founders' Society, semi-annual meeting, Hotel Sheraton-Cleveland, Cleveland.

Jan. 25-28—Plant Maintenance & Engineering Show, Convention Hall, Philadelphia

Feb. 4-5—Alloy Casting Institute, midwinter meeting, Hotel Key Biscayne, Key Biscayne, Fla.

Feb. 11-12—Wisconsin Regional Foundry Conference, Schroeder Hotel, Milwaukee.

Feb. 18-19—Southeastern Regional Foundry Conference, Thomas Jefferson Hotel, Birmingham.

Feb. 24-25—Malleable Founders' Society, Technical and Operating Conference, Cleveland.

Mar. 7-8—Steel Founders' Society of America, annual meeting, Drake Hotel, Chicago.

Mar. 16-17—Foundry Educational Foundation, annual college-industry conference, Hotel Statler-Hilton, Cleveland.

Apr. 13-14—Malleable Founders' Society, Market Development Conference, Edgewater Beach Hotel, Chicago.

May 9-13—AFS 64th Annual Castings Congress & Foundry Show, Convention Hall, Philadelphia.

May 9-13—American Society for Metals, Southwestern Metal Exposition & Congress, State Fair Park, Automobile Building, Dallas.

May 23-26—Design Engineering Show, Coliseum, New York

June 6-7—Malleable Founders' Society, annual meeting, Elbow Beach Surf Club, Hamilton, Bermuda.

June 19-21—Alloy Casting Institute, annual meeting, Homestead, Hot Springs, Va.

Sept. 6-16—National Machine Tool Builders Association, Machine Tool Exposition, International Amphitheatre, Chicago.

Sept. 6-16 — Production Engineering Show, Navy Pier, Chicago.

Sept. 19-20—Steel Founders' Society, fall meeting, Homestead, Hot Springs, Va.

Oct. 12-14—Gray Iron Founders' Society, annual meeting, Netherland Hilton Hotel, Cincinnati.

Oct. 21-23—Society for Experimental Stress Analysis, annual meeting, Pick Fort Shelby Hotel, Detroit.

Dec. 15—Association of Lift Truck & Portable Elevator Manufacturers, annual meeting, Savoy-Hilton Hotel, New York

Dec. 16—Industrial Truck Association, annual meeting, Savoy-Hilton Hotel, New York

THOUSANDS OF Carver RAPID MULLERS NOW IN USE

The most POPULAR, most PRACTICAL muller on the market . . . Here's why . . .

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- **3 times lower initial investment than with most mullers!**
- **Works equally well with *any* kind of binder!**

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I want to compare! Tell me more about Carver Rapid Muller.

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FOUNDRY _____

CITY _____ STATE _____

Circle 566 on Page 53

NEW

Ansco Superay 'D'

An ultra-speed x-ray emulsion specifically designed for use with intensifying screens of calcium tungstate types

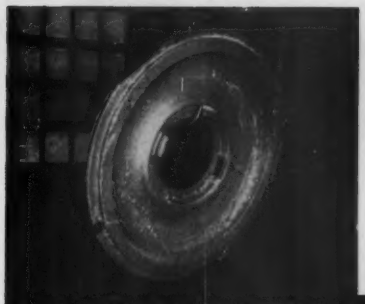
Here at last is an all new fine grain film that has extremely wide latitude when exposed either by direct x-rays or with lead screens.

Try this superb new film and see the consistently superior results in flaw detection through specimens having a wide range of thicknesses. All this plus higher performance with calcium tungstate intensifying screens to increase speed, make Ansco Superay 'D' ideal for testing heavy metals with low voltage equipment. Ansco, Binghamton, N.Y., A Division of General Aniline & Film Corporation.

Ansco

Industrial X-ray

Circle 567 on Page 53



Steel Tire Molds made by Lectromelt Casting Division of Akron Standard Mold Company, Akron, Ohio.

Steel Tractor Treads made by Lectromelt Casting Division of Akron Standard Mold Company, Akron, Ohio.

Iron Motor Housings made by Columbiana Pump Company, Columbiana, Ohio.

MORE PROFITABLE castings are made with...

NATIONAL* Western Bentonite

MORE PROFITABLE castings . . . regardless of type . . . are made by foundrymen, the world over, who use NATIONAL Western Bentonite in their molding sand.

There is good reason . . . NATIONAL Western Bentonite is a single purpose bentonite produced . . . exclusively for molding sand . . . to comply with the most exacting specifications.

Your results will be *profitable* when you use NATIONAL Western Bentonite . . . available from better foundry dealers everywhere.

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BAROID CHEMICALS, INC.

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NATIONAL Western Bentonite is available from dealers listed herewith:

ALABAMA—Foundry Service Co., Birmingham. **CALIFORNIA**—Independent Foundry Supply Co., Los Angeles—Industrial & Foundry Supply Co., Oakland 7. **ILLINOIS**—American Steel & Supply Co., Chicago 28—Western Materials Co., Chicago 3—Mathens Company, Moline—John P. Moninger, Elmwood Park. **INDIANA**—Steelman Sales Co., Munster. **MASSACHUSETTS**—Klien-Farris Co., Inc., Boston 11. **MICHIGAN**—Foundries Materials Co., Coldwater—Foundries Materials Co., Detroit—Warner R. Thompson Co., Detroit. **MINNESOTA**—Smith-Sharpe Co., Minneapolis. **MISSOURI**—Walter A. Zeis, Webster Groves. **NEW JERSEY**—Asbury Graphite Mills, Inc., Asbury. **NEW YORK**—Combined Supply & Equipment Co., Buffalo—Geo. W. Bryant Core Sands, Inc., McConnellsville. **OHIO**—The Buckeye Products Co., Cincinnati 16—The Hoffman Foundry Supply Co., Cleveland 13. **OREGON**—La Grand Industrial Supply Co., Portland 1. **PENNSYLVANIA**—Pennsylvania Foundry Supply & Sand Co., Philadelphia 24. **TENNESSEE**—Robbins & Bohr, Chattanooga 2. **TEXAS**—Sinclair-Brandt Equipment and Supply Company, Houston. **VIRGINIA**—Asher-Moore Company, Richmond 25. **WASHINGTON**—Carl F. Miller & Co., Seattle 4—Pearson & Smith, Inc., Spokane. **WISCONSIN**—Interstate Supply & Equipment Co., Milwaukee 4. **CANADA**—Canadian Foundry Supplies & Equipment Ltd., Montreal 30, Quebec (Main Office) and Toronto 14, Ontario.

Circle 568 on Page 53

Torque-control Nutsetters
Vertical Grinders
Drills
Nut Runners
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The Clecomatic*
Impact Wrenches
Air Lubricators, Regulators and Filters
Screwdrivers
Scalers
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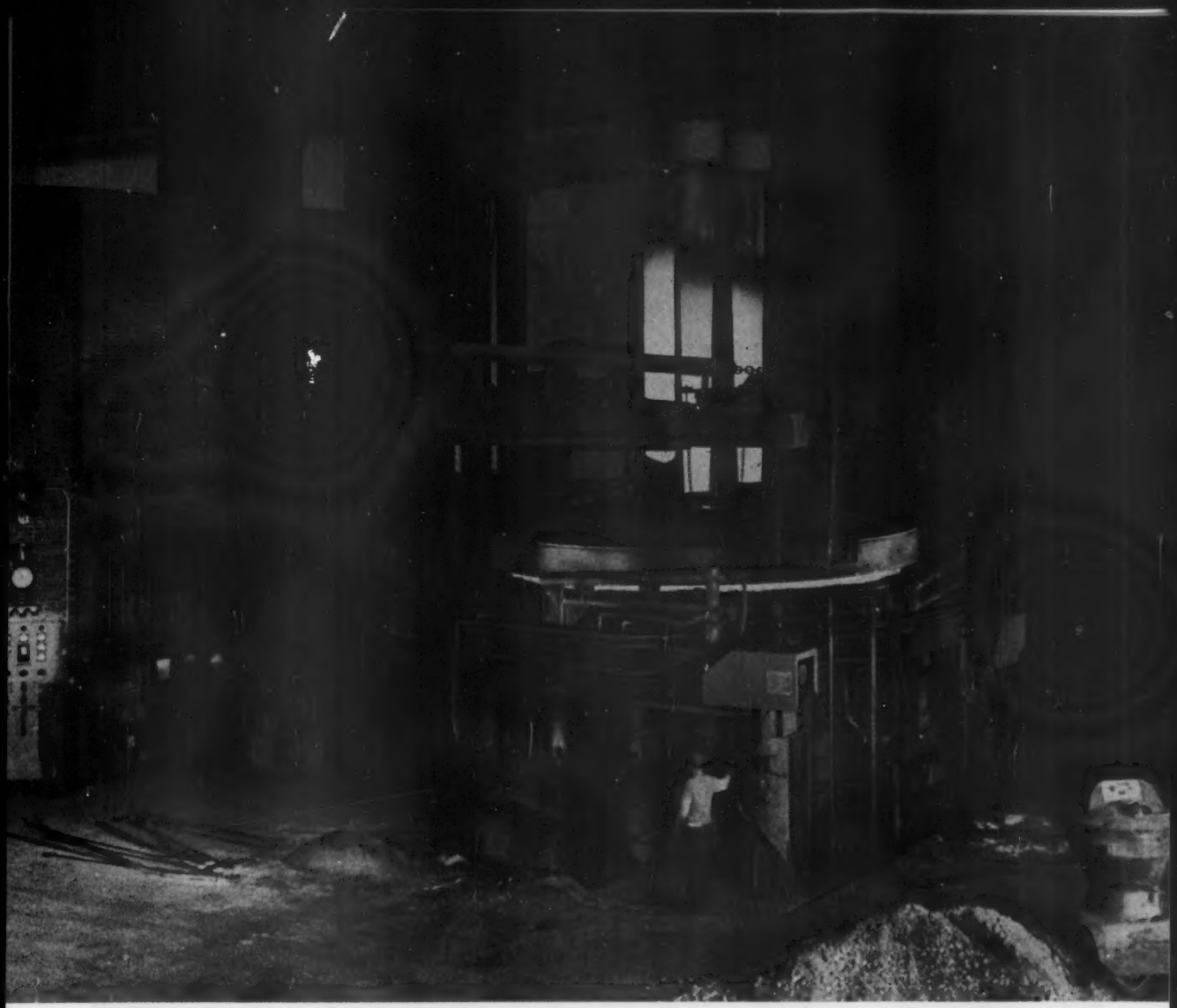
Wire Brush Machines
Scalers
Safety Coupling
Blow Guns
*Trademark
TOOL USERS KNOW!
CLECO
AIR TOOLS



Making High Quality Steel—At Low Cost

The growing demand for steels of increasingly higher quality has created a new kind of thinking. With conventional methods of obtaining both high quality and quantity being relatively slow, costly and often uncertain, more and more mills are turning to the modern Heroult Electric Furnace as the most reliable and economical means of making high-grade steel in large heats.

To keep abreast of this trend, Sharon Steel Corporation recently built a complete new Melt Shop at its Roemer Works in Farrel, Pennsylvania, and installed the large Heroult Electric Furnace shown above.

This 20′ diameter furnace turns out 90-ton heats of top-quality stainless in less than 8 hours. Space has been provided for a second Heroult when it is needed.

Moreover, electric furnaces are proving to be more efficient and economical in producing most *any* grade of steel in large or small heats. This is because electric furnace operations require a smaller investment, usually reduce both power and charging costs and produce a more uniform product.

American Bridge, exclusive manufacturers of the Heroult Electric Furnace, offers a complete electric furnace service. We have the facilities to handle the complete job—from foundation to furnace, from engineering to erecting. We are also prepared to modernize your old Heroult by installing improved new mechanisms that will increase the efficiency and productivity of your unit. And, if you own a Heroult, we can supply any needed replacement parts.

For more information, get in touch with the office nearest you. *USS and Heroult are registered trademarks*

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United States Steel Export Company, New York

Circle 570 on Page 53

THE BAFFLING CASE OF THE FAULTY BLOWERS

Another costly mystery solved–by the man from Kaiser Aluminum

THE PUZZLING FACTS. A good customer of Kaiser Aluminum had troubles. He manufactured a large blower casting which was to be used at high speeds. But inspection revealed that the casting had numerous cold shuts. The part was unsatisfactory. What to do?

HOW THE CASE WAS SOLVED. It looked like a tough problem, but the man from Kaiser Aluminum found an "out." He discovered that improper gating design was the villain. Redesigning the gating eliminated the difficulty and the case was solved.

WE LOVE A MYSTERY. This is one of many actual cases solved by Kaiser Aluminum working with a customer. Perhaps *you* have a mystery one of our technical engineers might help solve? He's ready to give you expert advice on any casting problem—including mold and die design, alloy selection, heat treatment, finishing, fluxing, metal transfer.

FULL ALLOY AVAILABILITIES. Kaiser Aluminum can supply you *fast* with a wide selection of casting alloys to suit any engineering requirement—from general purpose, low stressed alloys to high purity alloys having good properties at elevated temperatures.

FOR PIG AND INGOT with a free sleuthing bonus, call your nearest Kaiser Aluminum sales office now. Or write to: Kaiser Aluminum & Chemical Sales, Inc., 1924 Broadway, Oakland 12, California.

KAISER ALUMINUM
THE BRIGHT STAR OF METALS

See "MAVERICK" • Sunday Evenings, ABC-TV Network • Consult your local TV listing.

Need an oscillating conveyor now?

3 LINK-BELT types cover every need—all are immediately available from stock

Yes, Link-Belt makes a specific type of oscillating conveyor for every type of service.

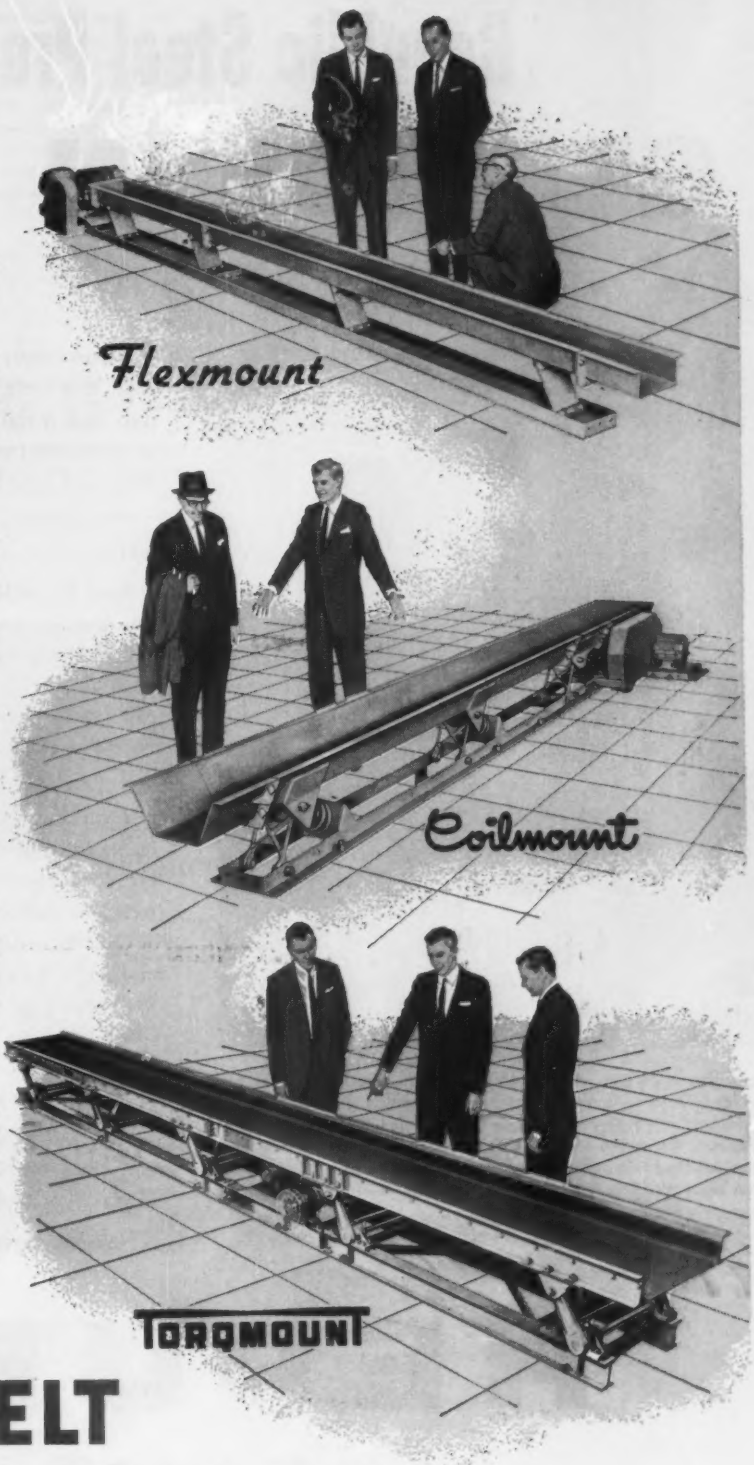
FLEXMOUNT for light-duty service. Ideal for gentle handling up to 25 TPH of 100-pounds-per-cubic-foot material. Widths of 8, 12 and 18 in.—all with 4-in. deep troughs. Flexmounts are pre-engineered — available from stock in 5- and 10-ft. sections.

COILMOUNT for medium-duty service. For applications up to 80 TPH of 100-pounds-per-cubic-foot material. Widths of 10 and 20 in. with 6-in. deep troughs. Available from stock in completely assembled 5- and 10-foot sections.

TORQMOUNT for heavy-duty service. For severe service requirements on installations with capacities up to 350 TPH of 100-pounds-per-cubic-foot material. Widths up to 48 in. with 8-in. deep troughs. Popular 36-in. size stocked.

In every case, Link-Belt POSITIVE ACTION controls the load at all times . . . assures continuous, uniform flow of materials regardless of surges. And each type functions as near to NATURAL FREQUENCY as possible, minimizing power requirements.

For the best in light-, medium- or heavy-duty conveying, call your nearby Link-Belt office or authorized stock-carrying distributor. Or write for new Book 2744 containing complete data on all three types.



LINK-BELT

OSCILLATING CONVEYORS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There are Link-Belt Plants, Sales Offices, Stock Carrying Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World. 15,121

Circle 572 on Page 53

Republic Steel Provides Pig Iron
SERVICE IN DEPTH

UNIFORM CHEMISTRY HELPS PRODUCE HIGHEST QUALITY DIE SETS. The Producto Machine Company, Bridgeport, Connecticut, casts die set parts using only raw materials with a definite known analysis, including Republic Pig Irons. The year-in, year-out uniform chemistry of these fine irons helps Producto produce high quality, laboratory-controlled castings. The company has found that there is no better, no more economical means for insuring strong, flaw-free, easy-to-machine castings.

Pig iron *service in depth* is an exclusive Republic concept. It is designed to help you solve foundry production and metallurgical problems—designed to help you produce better castings most efficiently, economically, and profitably.

Here is how *service in depth* helps foundrymen everywhere.

First, Republic is the only producer of both Northern and Southern Irons. This means you can select the proper grade from the most complete line of merchant pig iron available in the industry. Northern grades include Chateaugay, Malleable, Bessemer, Foundry, and Basic. Southern furnaces produce Foundry and Basic.

Then, Republic provides expert metallurgical service to assist you in selection, application, and processing. Republic Pig Iron Metallurgists are frequent and welcome visitors in hundreds of foundries. They have at their fingertips information on the latest processes and techniques available for improving castings, and for expanding their use and sale. Their suggestions often result in improved operations, increased production efficiency, and in recapturing business lost to other methods of fabrication.

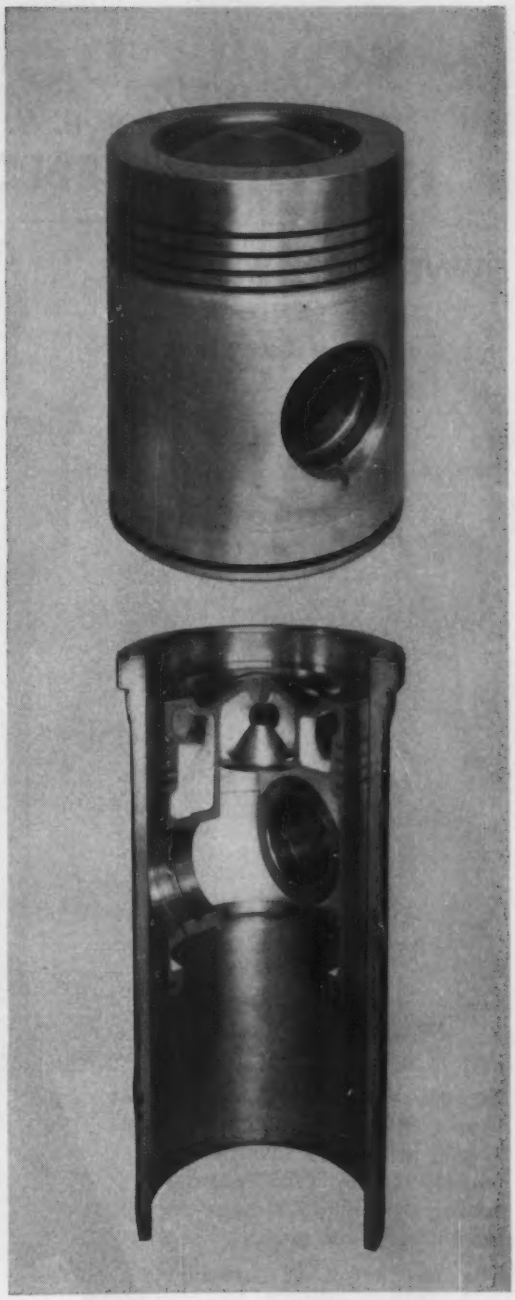
Service in depth is available now. Clip and mail the coupon for obligation-free metallurgical service, or for more information on Republic Pig Irons.

Here are three examples of pig iron *service in depth.*

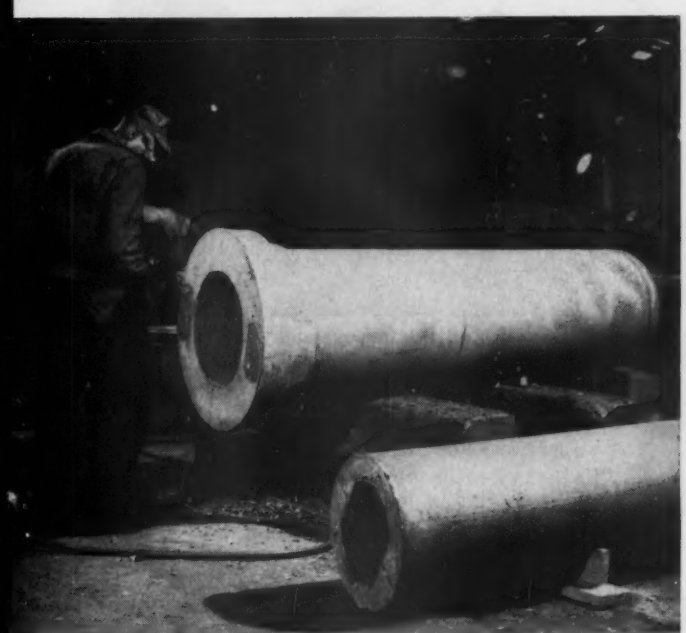
REPUBLIC

World's Widest Range of Standard Steels

CHATEAUGAY AGAIN PROVED IDEAL BASE METAL FOR DUCTILE IRON. Problem: Design a diesel engine piston with high mechanical strength, minimum weight, maximum wear- and heat-resistance, low ultimate cost. Using Chateaugay Pig Iron as the base metal, Hunt-Spiller Manufacturing Corporation, Boston, Massachusetts, successfully met all of these requirements in developing ductile iron diesel pistons as a replacement for aluminum. High total carbon and unusually low phosphorus, silicon, and manganese suit Chateaugay perfectly for ductile iron use. Inherently excellent physical properties are maintained in the ductile form assuring strong, flaw-free casting accurate to patterns and shapes.



METALLURGICAL SERVICE BENEFITS FOUNDRY'S CUSTOMER. On the advice of a Republic Pig Iron Metallurgist, Atlantic Foundry Company, Akron, Ohio, switched to Chateaugay Pig Iron for ram and cylinder castings used in hydraulic presses. The result: stronger castings, better machinability, higher wear-resistance, and a 21% saving to the customer. The value of Republic metallurgical service is pointed out in this statement by Atlantic's Vice President of Iron Foundry Operations. "When we have a foundry problem and put in a call for help, your metallurgical engineers are Johnny-on-the-spot, talking a language we can understand. Then it's not long before the problem is solved."



STEEL

and Steel Products

REPUBLIC STEEL

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Send more information on:
☐ Republic Pig Irons

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

Circle 573 on Page 53

YOU'LL DO A BETTER JOB

with H. V. ADAMS DESIGNED

HIGH EFFICIENCY FOUNDRY TOOLS

"UNIVERSAL FREE WHEELING"

FOUNDRY SAND RIDDLE

with the Double Eight Vibration

Because of its convenient size, light weight and good riddling capacity it long has been a favorite in the foundry. It also can be used for mixing core sand or for sifting sand directly into molds.

The mechanism is entirely enclosed protecting it from harmful dust and grit.

The main frame is cast in very strong tough aluminum.

It uses quick change ferruled sieves with 20 in. diameter sifting area. There are no loose wires to harm hands.

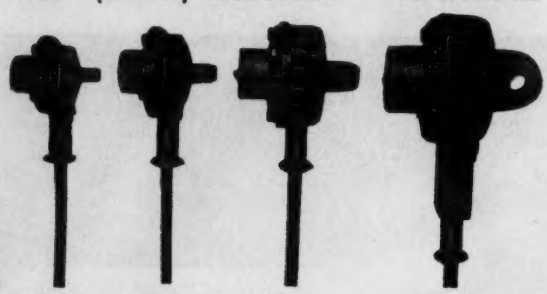
THE "ROTOPLANE" SPEED SIFTER

WILL GIVE YOU

- SPEED
- ECONOMY
- SAFETY
- LONGER LIFE
- GREATER SIFTING CAPACITY

Its sturdy one-piece frame and long shaft add to vibration effectiveness. The sealed-in mechanism assures protection of motor and bearings from exposure to dust and grit. This sealed in protection and "Rotoplane's" free-rotary action vastly increase bearing life. No exposed moving parts endanger the operator. Sieves have 20 inches diameter clear sifting area—are mounted in a smooth steel ferrule with no jagged edges to cause dangerous cuts and scratches.

"RED (Devil) ELECTRIC" VIBRATORS



No 1 No. 2 No. 5 No. 9

These hard hitting Adams designed Vibrators have served the foundries for over 30 years. They are provided with a 6 foot 3 wire authorized cable and 3 wire grounded connector which, when connected with our 3 wire grounded Red Electric Knee Switch, automatically grounds the vibrator protecting the worker from shock. The vibrators have passed the U. S. Government code inspection.

Other Foundry Products:

- No. 11 NOISELESS TYPE VIBRATOR
- A-20 ELECTRIC VIBRATOR
- RED ELECTRIC KNEE SWITCHES
- "ROTO" ADJUSTABLE BIN VIBRATOR
- 2 MIN. UNIVERSAL FINENESS TEST SIFTER.
- UNIVERSAL TRIPOD CARRIER

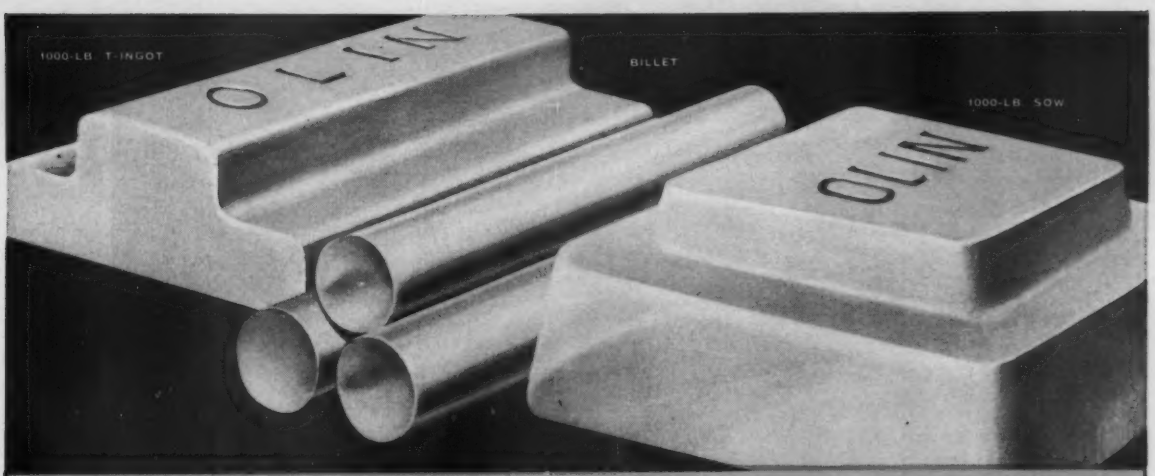
ORDER ALL SIFTERS AND VIBRATORS WITH GROUND WIRE!!

FOUNDRY SUPPLIES MANUFACTURING CO., NOT INC.

2221 Orchard Street - Chicago 14, Illinois

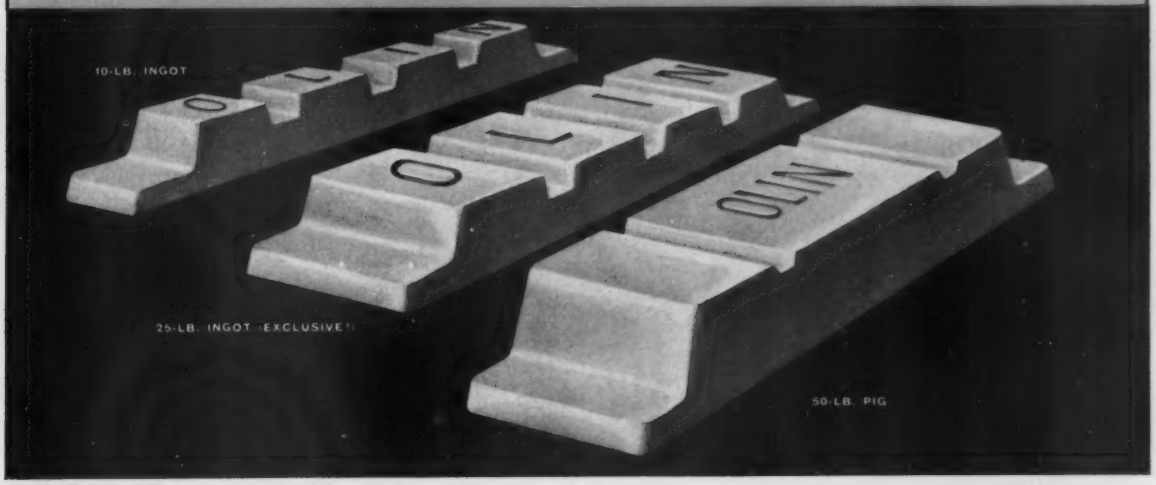
Established 1918 Cable Address: "Rotoplane Chicago" H. V. ADAMS, Mgr.

Circle 574 on Page 53



There's one for your every need

OLIN ALUMINUM PIG, INGOT AND BILLET



FOR EXTRUDERS

Pure pig in 50 and 1000 lb. sizes. **T-Ingot** in 1000 and 1500 lb. sizes. **Billet,** direct chill cast, in standard alloys, diameters and lengths, including log form. (Billet stock is supplied in special bundles to facilitate shipping and handling in your plant.)

FOR FOUNDRIES

Alloy pig and ingot, in standard alloys, in 10, 25 and 50 lb. sizes. (10 and 25 pounders offer exclusive benefits: smaller size to increase handling efficiency and speed melting; deep notches for easier breaking; 4-section design with smaller sections for faster crucible charging.)

FOR OTHERS

Pure pig, rotor ingot, custom alloys for special applications

You know what you're getting in Olin Aluminum. For this is primary metal—clean, uniform and with quality controlled by the most advanced techniques. So for dependable deliveries of pig, ingot or billet—call the Olin Aluminum Sales Office or distributor in your area.

SEE EDWARD R. MURROW ON "SMALL WORLD"—EVERY SUN. EVE., CBS-TV

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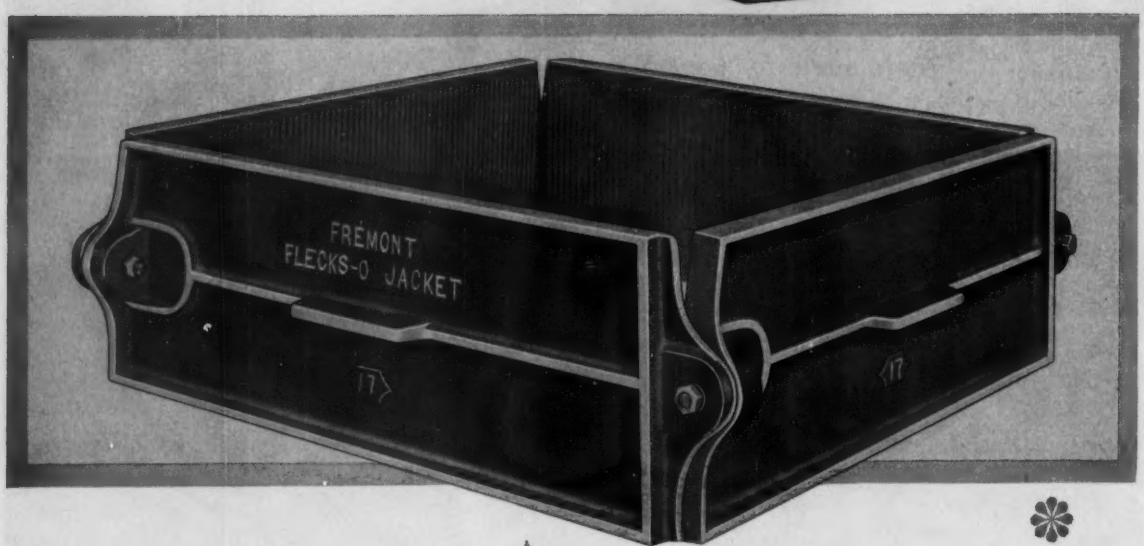


HIGH QUALITY STANDARD

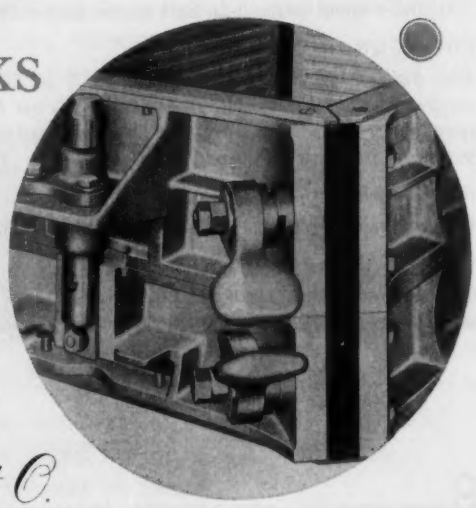
AND FLEXIBLE JACKETS

AND SPREADLOCK FLASKS

The Standard Jacket is rigid, built to do an outstanding job. Foundrymen agree that it does.

The new Flexible Jacket (the "FLECKS-O") was developed to eliminate shifts and run-outs. It is assembled from 4 castings. Replacement parts are completely machined and drilled. These can be installed simply by removing 2 nuts. Parts are furnished at very nominal costs. The Spreadlock Flask has tremendous corner strength. These flasks are made of magnesium, with cams of hardened steel forgings.

Write for descriptions and prices concerning these superior Fremont Flasks and Jackets.



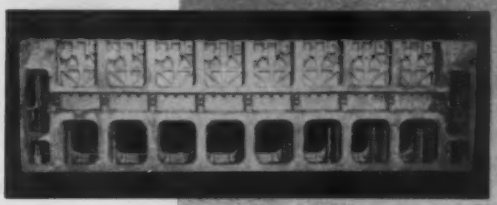
The Fremont Flask Co., Fremont, O.

FOR WHITE

DIESEL ENGINE DIVISION

The WHITE MOTOR COMPANY

SPRINGFIELD, OHIO



Better Castings LOWER COSTS

Comparison of Kold Set With Conventional Sand Cores		
	Number Required	Saving
CORE MAKING	358 Conventional Cores Required 174 Kold Set Cores Required	51% labor cost and 29½% material costs
Core ASSEMBLY	116 Conventional Cores Assemblies Required. 161 Kold Set Cores Required (No Assemblies)	70% labor saving
CLEANING		11% Labor Saving

With Kold Set . . . 31% Saving in overall Costs

Excellent results are being achieved with Kold-Set cores at White Diesel Engine Division's modern foundry on 8-cylinder diesels. These castings for White Superior engines involve intricate structures, ribbing and a variety of section thicknesses.

"Improved weight-saving design has been greatly aided by use of Kold-Set to achieve good structure within close tolerances."

"... through use of Kold-Set, which gave a more favorable casting and better metal soundness."

INDIRECT PHASES

Core Knock Out		Core Baking
Kold Set Sand Cores Over Conventional Sand Cores	75% Labor Saving	80 hours Conventional (one set) 24 hours Kold Set (one set)

Kold-Set is Patented in the United States

KOLD-SET®

PRODUCTS FOR FOUNDRY PROGRESS

G. E. SMITH, INC.

246 Washington Road Pittsburgh 16, Pa.

Warehouse Stocks in Chicago, Boston, Detroit, Philadelphia

Circle 577 on Page 53

International Minerals & Chemicals

A REPORT TO FOUNDRIES

FROM TOM BARLOW

News for nonferrous: In molding sands . . . the wetter the better!

It's nice to make castings better. It's nice to make castings cheaper. But it's *news* when you make them better and cheaper at the same time.

We've spoken here frequently of the unusual success resulting from using Plasti-Bond as an additive to both synthetic and natural sand to make good grey iron and malleable castings. The flowability of a Plasti -Bond sand together with its tendency to reduce buckles, scabs and veins has been a major item. This had to do with appearance.

In addition, however, the flowability imparted by Plasti-Bond permits a reduction in overall casting size which can contribute substantial savings. If we extend this same thinking to brass, bronze and aluminum with higher cost per pound of raw materials, the savings by dimensional control become startling.

Although high-pressure molding was developed originally for grey iron, we now find that about half of our applications are in the nonferrous field. The success here is related partly to the fact that these high-flowability sands, both natural and synthetic, provide the foundrymen with real savings by reducing casting weights from 2% to 5%. At the same time, we've learned to modify the practice to produce truly out-of-this-world finish on these nonferrous castings. The technique — or the change in the technique — that was evolved from the grey iron and malleable practice is either confusing or amusing or both.

Plasti-Bond sands were originally developed to reduce moisture contents. As a matter of fact, it is possible (although not recommended) to operate these sands *without* moisture. As we developed experience in nonferrous, however, we found that low-moisture sands, like the zero-moisture sands, had a tendency to develop epidemics of dirt holes.

Success was obtained when we reversed the cycle and used the Plasti-Bond not to reduce the moisture but to permit operation at higher moistures. We raised the bentonite levels and came up with strengths which would scare most brass men to death. However, these rather high-strength green sands with moistures of 4% or more had the flowability to provide truly outstanding surface appearance — and at the same time, gave the resistance to drying out and to dirt formation that was required.

It seems that in the nonferrous practice, then, the desire is not to eliminate moisture in the molding sand but to learn to live with it

successfully. When this is done, there are certain distinct advantages to the high-moisture level. The Plasti-Bond gives the flowability and the finish while the high moisture combined with somewhat higher clay gives the durability, versatility and freedom from casting defects.

It is no news that the brass and bronze people (and to a certain extent the aluminum people) are plagued with veining. Overnight elimination of this problem with Plasti-Bond has led to its wide acceptance, particularly in castings subject to this trouble. Some of the outstanding success has been in castings which tend to show ramoffs (occasionally described as shifts). Round castings such as valves, fittings, etc., are outstanding examples of this truly new approach to successful nonferrous founding.

"Out, Out, Damned Vein..."

Even ardent readers of Shakespeare might have difficulty recognizing the mis-quotation of Lady Macbeth which we use here for a title. However, if there is poetic license, certainly there is advertising license. We do hereby take advantage of such to introduce a new product, VEINAWAY sand.

One of the problems that has plagued the core room superintendent for years is the veining of intricate cores — particularly with pockets, recesses and depressions. This is a most troublesome problem, because materials previously added to eliminate veining also had a tendency to cause veining.

Since the above statement is completely confusing, let us clarify it. Materials added for the purpose of reducing or eliminating veining in cores do require additional oil or binder to offset the absorption that takes place. The additional oil or binder, in turn, tends to increase veining. Therefore, a good part of the effectiveness of the anti-veining material is lost because of the change in the binder. Perhaps of more direct (because it hits the pocketbook) importance is the fact that the absorption of additional binder increases the cost of making the core.

We have been looking at this problem off and on for some years, but our interest became intensified by the recent introduction of higher and higher priced binders. Such things as resins and oxygen-setting binders—even where they are completely warranted because of their application — are expensive. It is doubly important, therefore, that nothing be added to the core which increases the consumption of these expensive binders.

Research is now releasing Veinaway sand. This is a special sand used to replace regular core sand . . . usually at the range of 10% to 15%. It is somewhat more expensive than silica sand, but the overall effect — including the cost of the veins or of the otherwise increased binder — more than offsets what would be an expensive sand. This product controls the expansion rate of the core in such a way as to drastically reduce or eliminate the veining.

We have now had over six months' experience in the field. Although, like everything else, there has not been 100% success, the results have been truly gratifying.

This is one of those things that is easy to try. If you have a veining problem, you merely substitute 10% or 15% of the regular sand mixture with Veinaway sand. If you have previously been using a material such as iron oxide, you may easily be able to reduce oil or binder content.

In any event, as you use the Veinaway sand, you should check carefully for an increase in baked tensile or scratch hardness. This will normally occur. If such an increase in strength or hardness is found and the veining is a major problem, you obtain maximum results by reducing the binder level to obtain only that strength and hardness that you really desire. In this way, you get a double-barreled effect: the *direct* effect of the Veinaway sand plus the *indirect* effect of the reduced binder. In addition, of course, costs go down.

Being a sand, although a special one, normal consumption is expected to be bulk shipment. However, to get you started and to permit you to look at the results, we do have bagged material available in our Cleveland warehouse.

Products for Growth*

50 IMC

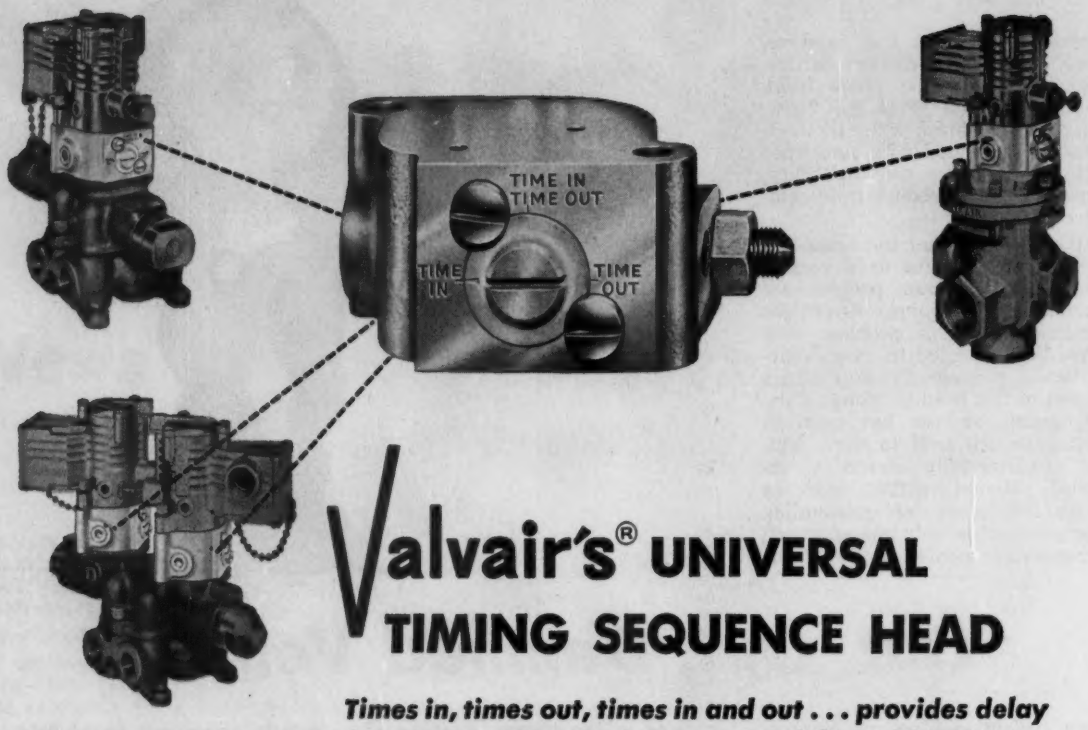
*Trademark

1909-1959

EASTERN CLAY PRODUCTS DEPT. 84-59

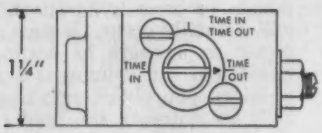
INTERNATIONAL MINERALS & CHEMICAL CORPORATION

Administrative Center, Old Orchard Road, Skokie, Illinois • ORchard 6-3000



Valvair's® UNIVERSAL TIMING SEQUENCE HEAD

Times in, times out, times in and out . . . provides delay from 0 up to 30 seconds . . . repeatability within 2% . . . changes function without disassembly . . . for use with any Valvair Speed King or Inline Valve



For accurate control, to simplify circuits, to eliminate timers and relays, to lower control component installation and maintenance costs, use Valvair's universal timing sequence head. This unit is supplied in two types; one for direct mounting between the pilot and valve body; one for direct mounting on the valve body, with remote pilot control.

Function can be changed in seconds, *without disassembly* and with line pressure on the valve. Just loosen the lock screws slightly, turn the indicating barrel to the desired function mark, then tighten the lock screws.

A port is provided for installation of accessory reservoir capacity . . . delay can be extended up to several minutes. And, the Valvair name on this unit is your assurance of sound design, quality construction, micro-accurate performance and multi-million cycle dependability!

Find out how Valvair's sequence head can provide the results you want, at a cost saving you'll like, on the new equipment you're designing or on existing machines you're up-grading. Yes, this sequence head can be used on your present SPEED KING and INLINE valves, too. Ask your Valvair or Bellows Field Engineer for recommendations . . . they're located in over 125 major industrial cities.

For more information, write for Bulletin E-1A. Address Dept. FO1159, Valvair Corporation, 454 Morgan Ave., Akron 11, Ohio.

Valvair AKRON 11, OHIO

Other INDUSTRIAL DIVISIONS of IBEC: The Sinclair-Collins Valve Co. The Bellows Co., Akron, Ohio • V. D. Anderson Co., Cleveland, Ohio.

8079

Late News

MEEHANITE SOLD: Meehanite Metal Corp., New Rochelle, N. Y., has been purchased by Harry H. Kessler & Associates, St. Louis. Mr. Kessler is president of Sorbo-Mat Process Engineers, St. Louis; Sorbo-Cast Corp., New Brunswick, N. J.; and Foundry Design Co., St. Louis, all of which provide various types of foundry consulting services. He will become president of Meehanite, and Oliver Smalley, former president, will remain as advisor and consultant. No change in location or method of operation is planned for Meehanite, which will operate as a separate company.

SDCE SHOW: The Society of Die Casting Engineers plans to sponsor an International Die Casting Exposition and Congress at Detroit Artillery Armory, Oak Park, Mich., on Nov. 8-11, 1960. It will feature exhibits by diecasters and by other firms closely connected with the industry. A program of technical papers relating to diecasting and allied fields also will be presented. Chairman for the event is John MacLauren, Aluminium Ltd. Sales Inc., Detroit.

ALUMINUM ENGINES: Initially, Chrysler Corp. is using its new six-cylinder gray iron powerplant in the Valiant, but the company may be on the way to installing a diecast aluminum engine in the economy car. Some months ago, Chrysler took delivery on a 2000-ton capacity diecasting machine, a unit as large as any ever built and capable of delivering a shot of about 75 lb of aluminum (enough for even a V-8 block). In operation at the firm's plant at Kokomo, Ind., it showed good

Foundry Statistics

Iron and Steel Scrap Consumption

(Gross tons*)

	All Scrap Total	By Types of Furnace — Cupola Total	Air Total	Electric Total
1957	65,638,592	9,220,405	1,026,951	8,576,400
1958				
May	3,982,491	596,253	59,060	553,756
5 mo.	18,573,256	3,135,593	327,725	2,741,393
June	4,409,006	615,271	62,703	605,735
July	3,716,739	543,726	47,203	513,394
Aug.	4,203,034	580,844	66,877	592,727
Sept.	4,472,219	689,660	71,198	637,400
Oct.	5,091,207	707,378	90,707	757,722
Nov.	4,803,615	700,704	74,382	691,078
Dec.	4,973,670	761,494	80,593	712,779
Total	50,242,746	7,725,970	821,388	7,152,726
1959				
Jan.	5,375,042	783,045	86,519	767,259
Feb.	5,657,873	791,137	88,326	801,692
Mar.	6,677,499	873,982	101,986	965,048
Apr.	6,644,905	911,313	106,972	996,126
May	6,642,572	868,661	99,256	1,029,573
5 mo.	31,015,891	4,228,138	503,059	4,559,728

Index of Foundry Equipment Orders

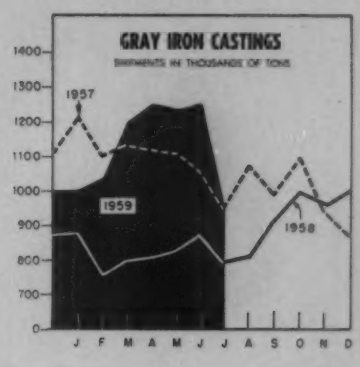
Foundry Trades Only

(Net Orders Closed, New Equipment)

	1958	1959
Jan.	57.9	127.4
Feb.	87.6	237.1
Mar.	85.9	166.6
Apr.	88.7	154.2
May	136.1	157.0
June	87.7	125.1
July	77.9	110.7
Aug.	74.1	134.1
Sept.	64.5	....
Oct.	118.9	....
Nov.	83.3	....
Dec.	137.0	....

Note: Base period 1947-49 taken as 100 per cent monthly average.

Source: Foundry Equipment Manufacturers Association.



GRAY IRON CASTINGS—SHIPMENTS

(Net tons*)

	All Castings — Total	All Castings — For Sale	Miscellaneous Castings Total	Miscellaneous Castings For Sale	Nodular Iron Castings Total	Heavy Steel Ingot Molds Total	Chilled Railroad Car Wheels Total	Pressure Pipe & Fittings Total†	Soil Pipe & Fittings Totals‡	Unfilled Orders‡
1957	12,664,504	6,876,497	7,755,229	3,310,915	.....	2,409,290	359,232	1,351,345	755,308	.....
1958										
July	791,560	485,650	430,583	185,275	8,696	157,478	19,928	110,790	72,481	589,155
7 mo.	5,703,411	3,210,172	3,470,631	1,492,942	65,703	925,921	166,002	709,955	430,902	.....
Aug.	802,473	513,863	410,876	205,321	8,323	165,006	18,537	129,157	78,897	614,199
Sept.	916,704	537,717	518,185	227,414	7,902	175,323	30,783	125,693	76,720	644,334
Oct.	992,730	586,614	551,380	253,062	10,557	207,500	22,970	129,375	81,505	619,867
Nov.	958,306	505,290	575,586	231,660	11,731	201,704	18,801	98,326	63,889	602,375
Dec.	997,606	509,490	628,720	246,289	13,072	208,942	18,021	85,179	56,746	608,096
Total	10,371,232	5,863,154	6,155,378	2,657,197	117,588	1,884,396	265,114	1,277,685	733,659	.....
1959										
Jan.	1,001,771	517,390	625,604	250,161	12,061	214,935	27,650	75,571	58,056	687,245
Feb.	1,036,655	538,514	642,882	252,115	12,619	230,706	31,035	78,147	55,885	767,360
Mar.	1,205,572	666,034	701,527	286,692	13,881	270,293	35,820	108,131	89,801	846,937
Apr.	1,245,702	688,755	726,105	295,962	14,663	270,476	35,655	129,861	83,605	892,214
May	1,236,250	685,285	706,073	285,507	16,003	275,563	36,960	141,675	75,979	884,779
June	1,252,016	717,067	707,291	295,064	15,510	268,479	30,723	160,540	84,983	836,707
July	943,495	532,978	602,261	252,907	14,508	197,604	20,486	123,175	79,960	897,536
7 mo.	7,821,462	4,346,021	4,711,743	1,918,428	99,245	1,638,106	218,329	820,099	528,269	.....

*Source: U. S. Dept. of Interior Bureau of Mines. †Source: Bureau of Census. ‡For sale only. §All cast iron pipe is shipped for sale.

enough results that three more like it were ordered recently.

This development is in the face of rumors that Chevrolet made some unsuccessful Corvair blocks of a hypereutectic (very high silicon) aluminum alloy. This alloy has been mentioned often as one possible means of achieving good wear resistance without iron cylinders or liners, provided that machining problems could be overcome. But Chevy reportedly was unable to attain adequate wear resistance, and Corvair uses gray iron cylinders. Chrysler therefore probably is planning on iron liners.

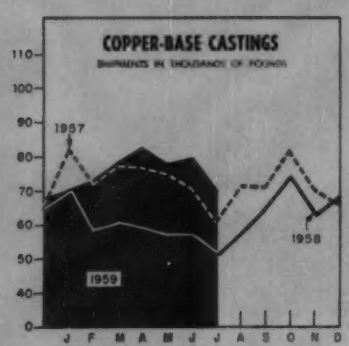
Just to muddy the waters a little more, Rolls-Royce has announced that its new Silver Cloud and S-series Bentley models will use a V-8 aluminum engine—but this one is sand cast. It also uses gray iron liners.

FARMS USE DUCTILE: In 1959, the farm equipment industry will more than double its 1958 consumption of ductile iron castings, according to Donald J. Reese, director, Ductile Iron Div., International Nickel Co. About 12,000 tons went into farm machinery in 1958, and about 27,000 tons will be used this year, he says. Part of the increase is due to bigger sales of farm equipment—at their highest in nearly ten years—but much comes from use of ductile iron castings instead of weldments and forgings. Mr. Reese expects the farm implement industry to use 100,000 tons of ductile iron annually within a few years.

BUYS MAGNAFLUX: General Mills Inc., Minneapolis, has acquired the business and assets of Magnaflux Corp., Chicago, producer of nondestructive testing systems. Magnaflux will operate at the same location and under the same name as a wholly owned subsidiary. F. B. Doane will retire as president and board chairman, but will serve as a consultant. He will be succeeded as president by R. A. Wilson, vice president of General Mills and general manager of its Mechanical Div. Other key officers and personnel of Magnaflux will be retained.

PERSONALS: W. Thomas Gettig, assistant to the vice president, Meter & Valve Div., Rockwell Mfg. Co., has been named vice president and general manager, LFM Mfg. Co., Atchison,

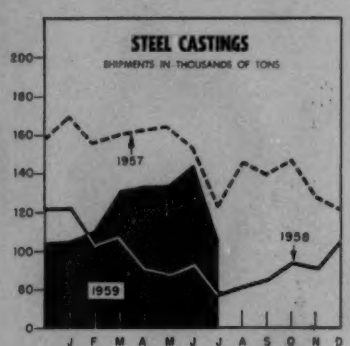
Foundry Statistics



COPPER-BASE CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments			
	Total	Sand	Perm. Mold	Unfilled Orders[2]
1957	874,627	789,014	44,789	.....
1958				
July	51,124	46,636	2,351	20,518
7 mo. ..	413,285	373,388	21,738	.....
Aug.	57,790	52,981	2,425	24,351
Sept.	64,447	58,435	2,883	25,655
Oct.	74,012	67,564	3,239	26,726
Nov.	62,746	57,386	2,604	24,928
Dec.	67,905	61,119	3,535	25,078
Total ..	740,155	670,873	36,420	.....
1959				
Jan.	70,123	62,296	3,753	25,344
Feb.	72,754	64,558	4,007	26,468
Mar.	78,641	69,472	4,333	29,373
Apr.	82,799	73,567	4,640	29,941
May	78,413	69,351	4,363	27,074
June	79,366	70,512	4,421	30,389
July	69,389	61,966	3,869	31,838
7 mo. ..	531,485	471,692	29,386	.....



STEEL CASTINGS—SHIPMENTS

(Net tons[1])

	All Castings			Carbon			Alloy			
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Unfilled Orders[2]
1957	1,766,191	1,359,747	349,050	1,328,478	1,019,090	224,951	437,713	340,657	24,108	.....
1958										
July	68,802	48,613	5,400	46,858	32,161	4,656	21,944	16,457	744	200,272
7 mo.	670,381	512,069	97,329	480,201	368,237	59,841	190,180	143,832	7,488	.....
Aug.	80,886	59,816	8,021	57,539	42,969	7,090	23,347	17,447	931	196,300
Sept.	85,277	64,586	9,205	60,392	44,890	7,905	24,885	19,696	1,300	196,482
Oct.	95,389	73,367	12,254	67,906	51,065	10,980	27,483	22,302	1,274	184,925
Nov.	85,267	65,788	9,648	59,793	45,808	8,501	25,474	19,980	1,147	193,960
Dec.	103,800	81,360	13,187	76,015	59,171	11,934	27,785	22,189	1,253	214,352
Total	1,121,000	856,996	149,644	801,846	606,240	136,251	319,154	256,746	13,393	.....
1959										
Jan.	105,392	82,683	14,403	76,242	59,027	12,948	29,150	23,656	1,460	232,646
Feb.	110,280	86,013	14,686	79,365	61,281	13,316	30,645	24,752	1,370	245,096
Mar.	131,317	103,848	20,086	93,309	75,968	18,410	35,008	27,880	1,676	270,682
Apr.	134,344	104,890	21,372	99,295	76,802	19,761	35,049	28,088	1,611	271,613
May	135,359	105,804	23,825	101,504	78,767	22,498	33,855	27,037	1,327	263,909
June	143,624	111,725	26,567	107,000	82,485	24,565	36,624	29,240	1,999	248,782
July	106,790	83,541	16,007	78,316	60,502	14,520	28,474	23,039	1,487	274,085
7 mo.	867,106	678,504	136,951	635,031	494,812	126,021	228,805	183,692	10,930	.....

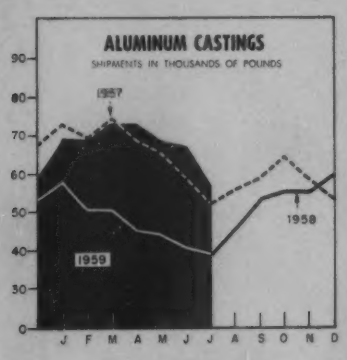
[1]Source: Bureau of Census. [2]For sale only.

Kans. LFM is a wholly owned subsidiary of Rockwell . . . Carl Decina has joined Rolle Mfg. Co., Lansdale, Pa., as plant superintendent . . . Wendell P. McKown has been appointed general manager of the Shenango Furnace Co.'s Centrifugally Cast Products Div. plant at Dover, Ohio . . . William H. Schweikert has joined Precision Castparts Corp., Portland, Oreg., as technical director.

FEMA OFFICERS: Einar A. Borch, executive vice president, National Metal Abrasive Co., Cleveland, was elected president of the Foundry Equipment Manufacturers Association at its recent 41st annual meeting. Other officers elected are R. A. Brackett, executive vice president, Spencer Turbine Co., Hartford, Conn., first vice president; C. G. Hawley, general manager of sales, Industrial Div., Jeffrey Mfg. Co., Columbus, Ohio, second vice president; C. R. Heller, Washington, executive secretary-treasurer.

OBITUARY: E. O. Beardsley, a founder and former president of Beardsley & Piper Co., Chicago, died in Lilliwaup, Wash. . . . William S. Haney, former vice president of sales, Penn Steel Castings Co., Chester, Pa., died Oct. 6 . . . Dan P. Eells, 75, a former vice president of Bucyrus-Erie Co., Milwaukee, and chairman of the board, Basic Inc., Cleveland, until his retirement in 1945, died in Milwaukee . . . Herbert W. Richter, 58, a supervisor at Chain Belt Co., Milwaukee, died Oct. 10.

MISCELLANY: Woodward Iron Co., Woodward, Ala., has offered $2½ million to purchase the assets of Western Foundry Co., Tyler, Tex. . . . Standard Buffalo Foundry Inc., Buffalo, closed Sept. 30 . . . Anselman Foundry Services, St. Charles, Ill., is selling the Lexington, Tenn., naturally bonded molding sands of Ayers Mineral Co. throughout most of Illinois and Indiana . . . Pangborn Canada Ltd. has been formed with offices at 38 Mattson Rd., Toronto, to market the complete line of products of Pangborn Corp., Hagerstown, Md., in Canada . . . Eastern Gas & Fuel Associates, Boston, has shut down its blast furnace in Everett, Mass. . . . The business and certain assets of Milwaukee Valve Co., Milwaukee, a subsidiary of Control Co. of American, Schiller Park, Ill., have been sold to a group of Chicago investors.



PRODUCTION WORKERS

Estimated Number

	July 1959	June 1959	July 1958
Ferrous	197,700	199,800	159,200
Nonferrous	52,400	53,400	42,300

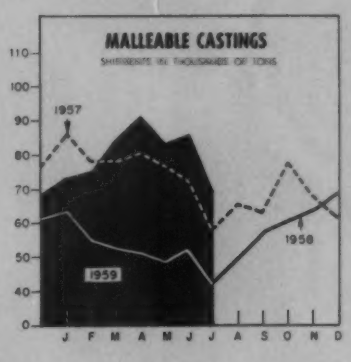
Average Weekly Earnings

Gray Iron	$98.40	$100.02	$84.22
Malleable Iron	96.82	96.87	84.83
Steel	103.12	106.08	91.50
Nonferrous	98.82	100.77	91.98

Average Weekly Hours

Gray Iron	41.0	41.5	37.1
Malleable Iron	40.6	40.7	37.7
Steel	40.6	41.6	37.5
Nonferrous	40.5	41.3	39.3

Source: Bureau of Labor Statistics.



ALUMINUM CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments Total	Sand	Perm. Mold	Die	Unfilled Orders[2]
1957	751,818	143,991	232,326	373,586	.....
1958					
July	38,818	8,658	12,342	17,714	68,618
7 mo.	327,647	65,781	101,831	159,187	.....
Aug.	45,034	9,034	14,426	21,505	71,135
Sept.	52,796	10,261	16,241	26,254	72,819
Oct.	55,699	10,932	17,189	27,511	73,474
Nov.	55,793	10,539	16,942	28,264	76,370
Dec.	59,487	10,874	18,970	29,579	78,732
Total	596,456	117,421	195,599	292,300	.....
1959					
Jan.	65,896	11,238	24,844	32,513	83,314
Feb.	63,351	10,802	25,423	32,147	82,001
Mar.	73,351	12,412	26,964	33,949	82,676
Apr.	72,976	12,700	26,153	33,992	85,636
May	68,268	11,979	25,283	30,877	80,325
June	66,479	12,312	24,927	29,092	81,228
July	56,896	11,581	20,410	24,771	80,426
7 mo.	475,247	83,024	174,009	217,641	.....

[1]Source: Bureau of the Census. [2]For sale only.

MALLEABLE IRON CASTINGS

(Shipments of castings—net tons[1])

	Shipments Total	For Sale	Standard Total	For Sale	Pearlitic Total	For Sale	Unfilled Orders[2]
1957	862,976	520,113	713,539	431,662	149,437	88,456	.....
1958							
July	41,365	24,479	33,857	20,023	8,606	4,456	58,340
7 mo.	361,550	205,150	295,870	169,247	62,960	37,903	.....
Aug.	49,252	29,414	41,734	24,696	7,518	4,718	55,145
Sept.	56,836	31,999	45,945	26,370	10,891	5,629	58,405
Oct.	60,981	40,014	50,181	31,992	10,800	8,022	63,425
Nov.	63,356	35,221	50,063	25,409	13,293	9,812	66,725
Dec.	65,385	40,041	52,797	32,883	14,588	7,158	65,904
Total	660,650	383,830	540,690	313,597	120,650	70,242	.....
1959							
Jan.	73,186	43,667	56,700	35,129	16,486	8,538	77,322
Feb.	74,760	42,093	57,573	31,976	17,187	10,117	90,291
Mar.	84,335	49,690	67,439	40,515	16,896	9,175	95,822
Apr.	90,974	54,306	75,583	43,835	15,391	10,471	102,506
May	83,472	49,619	66,513	40,435	16,960	9,181	99,879
June	85,497	51,411	68,426	42,453	17,071	8,958	95,339
July	69,184	43,128	55,120	35,787	14,064	7,341	75,252
7 mo.	561,406	333,884	447,353	270,143	117,055	63,771	.....

Prices of Foundry Metals and Coke

(As of Oct. 24, 1939)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE

Connellsville	$18.00-18.50

OVEN

Birmingham	$20.25
Buffalo	32.00
Detroit	32.00
Erie, Pa.	32.00
Indianapolis	31.25
Kearny, N. J.	31.25
Milwaukee	32.00
Neville Island (Pittsburgh)	30.75
New England, deld.	33.55
New Haven, Conn.	31.00
Painesville, O.	32.00
Philadelphia	31.00
St. Louis	33.00
St. Paul	31.25
Swedeland, Pa.	31.00
Terre Haute, Ind.	31.25

PIG IRON

(Per gross ton, f.o.b. furnace)

	No. 2 Foundry	Malleable
Birdsboro, Pa.	$65.50	$69.00
Birmingham	62.50	66.50
Buffalo	65.50	67.00
Chester, Pa.	65.50	69.00
Chicago	66.50	66.50
Cleveland	66.50	66.50
Duluth	66.50	66.50
Erie, Pa.	66.50	66.50
Everett, Mass.	68.00	68.50
Fontana, Calif.	75.50	....
Geneva, Utah	66.50	....
Granite City, Ill.	65.40	66.90
Neville Island (Pittsburgh)	66.50	66.50
Swedeland, Pa.	65.50	69.00
Toledo, O.	66.50	66.50
Troy, N. Y.	68.50	69.00
Youngstown, O.	....	66.50

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 29.25; tin bronze, No. 225, 39.75; No. 245, 33.50; high-leaded tin bronze, No. 305, 33.50; No. 1 yellow, No. 405, 23.75; manganese bronze, No. 421, 26.75.

ALUMINUM: 99 per cent plus primary ingots 28.80. Secondary No. 12 alloy, 23.75-24.00. Deoxidizing grades: No. 1, 24.50; No. 4, 21.50.

MAGNESIUM: 99.8 per cent notched ingots 28.00, f.o.b. Velasco, Tex. (10,000 lb or more).

COPPER: Electrolytic 30.00-31.50, delivered Connecticut valley.

ZINC: High grade 14.25, delivered. Die casting alloy No. 3, 16.25; No. 2, 16.75, delivered.

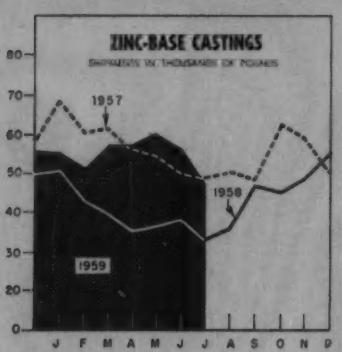
Iron and Steel Scrap

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$35.00-36.00	$53.00-54.00	.....	.....	.....	.....	$49.00-50.00
Boston*	**33.00-34.00	**37.00-38.00	.....	.....	**38.00-38.50	.....	.....
Buffalo	33.00-34.00	**47.00-48.00	.....	.....	**51.00-52.00	.....	51.00-52.00
Chicago	44.00-45.00	57.00-58.00	.....	63.00-64.00	63.00-64.00	65.00-66.00	63.00-65.00
Cincinnati*	**37.50-38.50	**48.00-49.00	**43.00-44.00	.....	**58.00-59.00	.....	**58.00-59.00
Cleveland	41.00-42.00	55.00-56.00	41.00-42.00	58.00-59.00	55.00-56.00	66.00-67.00	61.00-63.00
Detroit*	**36.50-37.50	**46.00-47.00	**36.00-37.00	**47.00-48.00	.....	.....	.....
Los Angeles	40.00	**47.00	.....	.....	.....	.....	.....
New York*	33.00-34.00	38.00-39.00	35.00-36.00	.....	.....	.....	.....
Philadelphia	45.00	46.00-47.00	45.00	.....	54.00	68.00	.....
Pittsburgh	44.00-45.00	48.00-49.00	.....	47.00-48.00	53.00-54.00	.....	65.00-67.00
St. Louis*	39.00	54.00	44.00	56.00	.....	.....	56.00
San Francisco	36.00	47.00	28.00	46.00	46.00	.....	.....
Seattle	35.00	34.00	28.00	.....	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point

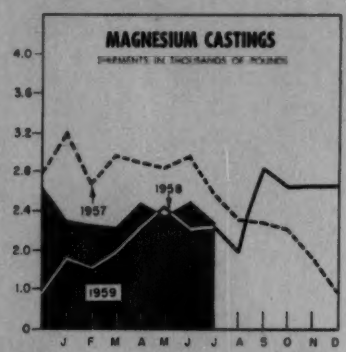
Foundry Statistics



PIG IRON

PRODUCTION*—Net Tons

	Foundry	Malleable & Silvery	Low & Int. Low Phos. & Bessemer
1957	2,275,789	3,697,325	7,452,203
1958			
July	123,075	186,582	402,550
7 mo.	871,966	1,315,974	2,690,637
Aug.	141,185	145,216	396,511
Sept.	133,556	234,752	416,026
Oct.	146,386	257,111	575,806
Nov.	175,210	257,131	439,095
Dec.	154,097	272,375	429,299
Total†	1,622,320	2,448,917	4,954,854
1959			
Jan.	190,392	283,105	479,019
Feb.	121,716	358,280	312,284
Mar.	173,881	341,218	412,533
April	159,950	296,384	427,227
May	198,126	358,067	474,320
June	185,158	346,231	441,062
July	.....	.....	.....
7 mo.	.....	.....	.....



ZINC-BASE CASTING

(Shipments of castings—1000 pounds‡)

	Shipments—Total	Shipments—For Sale	Unfilled Orders†
1957	669,775	431,509	.....
1958			
July	32,765	22,843	41,534
7 mo.	276,114	181,886	.....
Aug.	35,580	26,971	45,066
Sept.	47,127	33,520	50,762
Oct.	45,045	36,103	58,154
Nov.	48,431	34,054	57,864
Dec.	55,070	39,768	56,756
Total	506,177	352,302	.....
1959			
Jan.	55,439	38,661	61,192
Feb.	51,368	35,478	57,437
Mar.	57,600	40,700	62,657
Apr.	57,325	40,127	55,916
May	60,656	43,920	62,224
June	56,125	40,226	54,097
July	46,789	34,606	52,677
7 mo.	385,305	273,718	.....

CONSUMPTION*—Gross Tons

	Cupola	Air	Electric
1957	4,160,891	218,178	246,851
1958			
May	256,204	12,001	11,784
5 mo.	1,356,157	69,564	53,268
June	262,883	12,098	15,549
July	239,140	10,550	12,140
Aug.	247,428	13,196	32,309
Sept.	300,173	14,994	27,750
Oct.	300,115	17,393	34,273
Nov.	287,013	14,862	31,397
Dec.	321,741	16,610	25,450
Total	3,314,652	169,267	231,145
1959			
Jan.	321,302	17,213	36,783
Feb.	324,376	17,950	37,414
Mar.	353,985	20,625	42,464
Apr.	366,376	21,997	41,597
May	358,192	20,424	40,812
5 mo.	1,724,733	98,119	199,070

MAGNESIUM CASTINGS

(Shipments of castings—1000 pounds‡)

	Shipments—Total	Shipments—For Sale	Unfilled Orders†
1957	30,322	28,452	.....
1958			
July	2,200	2,063	6,706
7 mo.	14,701	13,742	.....
Aug.	1,869	1,808	6,698
Sept.	2,864	2,581	6,083
Oct.	2,627	2,479	5,463
Nov.	2,615	2,523	4,063
Dec.	2,612	2,384	5,115
Total	27,226	25,517	.....
1959			
Jan.	2,291	2,086	5,001
Feb.	2,249	1,995	4,637
Mar.	2,129	1,924	4,465
Apr.	2,455	2,213	4,787
May	2,370	2,093	5,102
June	2,484	3,207	4,664
July	2,265	1,875	3,995
7 mo.	16,243	15,393	.....

*Source: U. S. Dept. of Interior, Bureau of Mines. **Source: American Iron & Steel Institute. ‡Source: Bureau of the Census. †For sale only. †Monthly figures do not add up to totals shown because of unreported monthly revisions.

Another Quality Product by PENN-RILLTON

PENN-RILLTON
KILN DRIED HARDWOOD
WOOD FLOUR

FOR BETTER
SAND MOLD CASTINGS

Enlargement shows cross-section of casting made without P-R Wood Flour. Note scab and rough surface.

Cross-section of casting made with P-R Wood Flour. Sand expansion defects have been eliminated.

Yes, PENN-RILLTON now has wood flour. The grading is uniform, and the material meets the standard of quality required of all our products. It is a kiln-dried hardwood wood flour . . . low in ash, moisture, and extractable matter . . . the basic content being pure cellulose. Production testing has revealed these characteristics:

- Assists the clay and stabilizes the varying strength of the sand during pouring.
- Increases flowability of sand mixture through a sand system.
- Improves shakeout.

GET THESE ADVANTAGES

1. Reduces sand expansion defects such as scabs, buckles, and rat-tails thus lowering scrap losses.
2. Mold costs are reduced because flowability of sand is increased.
3. Time is saved, less equipment needed due to improved collapsibility.
4. Needs only ½ to 1% with new sand and as low as ¼% with reused sand.
5. Permits hard ramming.
6. Cuts down shakeout time; improved shakeout saves sand.

WHERE YOU CAN GET P-R WOOD FLOUR

FENTON FOUNDRY SUPPLY CO.
Dayton, Ohio
HOFFMAN FOUNDRY SUPPLY CO.
Cleveland, Ohio
WOLVERINE FOUNDRY SUPPLY CO.
Detroit, Mich.
CANADIAN FOUNDRY SUPPLIES & EQUIPMENT, LTD.
Montreal, Toronto, Canada
COMBINED SUPPLY & EQUIPMENT CO.
Buffalo, New York
WHITEHEAD BROTHERS COMPANY
New York, N. Y., Providence, R. I.
FOUNDRIES MATERIALS COMPANY
Coldwater, Mich.
LANCASTER FOUNDRY SUPPLY CO.
Lancaster, Pa.

P-R

Manufacturers of:
Faceamol Spray-On, Hygeia Seacoal, Hygeia Nu-Bond Pitch, Blended Core Compounds
PLANTS: Irwin and West Elizabeth, Pa.

PENN-RILLTON COMPANY
326 West 23rd Street, New York 11, N. Y.

Circle 580 on Page 53

Mechanize with Jeffrey:

Large mold quickly filled with sand from Jeffrey Flaskfillers, fed from hopper. Jeffrey equipment for mechanizing mold preparation includes Flaskfillers, Hoppers, Automatic Measuring Boxes, Rotary Plate Feeders.

PUSHBUTTON SAND DELIVERY

Cuts Molding Time—Points To Profits

Sand when and where you want it at the touch of a button—that's efficiency in mold preparation. That's what we mean when we say "Mechanize with Jeffrey".

Delivered to overhead hoppers by crane, bucket elevator or belt conveyor, thence to flaskfillers—sand flows directly into the flasks. Saves floor space and shoveling time. Low-cost "package" systems with no custom engineering are available—built to serve two or more stations.

Write for Catalog No. 911, the bible of the foundry industry—modern equipment backed by sound engineering. The Jeffrey Manufacturing Company, 907 N. Fourth St., Columbus 16, Ohio.

JEFFREY

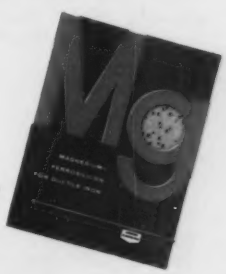
CONVEYING • PROCESSING • MINING EQUIPMENT...TRANSMISSION MACHINERY...CONTRACT MANUFACTURING

"It's the lowest cost alloy for ductile iron"

Foundries find that ELECTROMET magnesium-ferrosilicon is an economical, convenient source of magnesium for ductile iron. When added to a suitable composition, the alloy gives maximum ductility by promoting a matrix of soft ferrite. By adjusting the analysis, it can easily be used in high-strength irons having somewhat lower ductility.

Magnesium-ferrosilicon is available in grades with or without cerium. Cerium (0.5 or 2%) helps control unwanted residual elements which hinder the formation of spheroidal graphite. For further information and technical assistance, contact your UNION CARBIDE METALS representative.

UNION CARBIDE METALS COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y.



Write for the folder, "Magnesium-Ferrosilicon for Ductile Iron."

UNION CARBIDE METALS

Electromet Brand Ferroalloys and other Metallurgical Products

The terms "Electromet" and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

Circle 582 on Page 53

Harry Demerjian increased

Harry Demerjian has more than 25 years experience as an abrasive specialist. After a war-time career in the U. S. Army Signal Corps, he set up his own business, Abrasive Sales Co., in New York City and he's been a highly successful Bay State representative ever since.

cut-off production 50% at Frank Roth Co.

They had a right to be skeptical at the Frank Roth Foundry in New York City, when they first saw Bay State's BZ2AA cut-off wheel. A wheel that's only 1/8" thick looks pretty thin when you've been using a conventional 16" x 5/32" x 1" cut-off. When you start thinking about possible warpage and flutter, not to mention *shattering*, it's enough to give you nightmares.

BUT... Bay State distributor Harry Demerjian put on a demonstration that convinced operators, foremen and management, too, that the BZ2AA was one of the safest cut-off wheels ever made. On top of this, it cut straight and true without a sign of flutter... and it cut faster, lasted longer and saved material because its thin edge ground away 20% less metal. Cutting investment castings of extremely hard and expensive materials, the BZ2AA increased production a full 50% and made substantial savings by increasing scrap salvage, too.

Like Harry Demerjian, your own Bay State representative is an experienced abrasive specialist as well as a good salesman. *Better grinding at lower cost... that is his business.*

Foundry Foreman Henry Koster cuts gates off extremely hard cobalt-chromium-tungsten swaging die castings... a job that goes 50% faster with Bay State's BZ2AA than it did with the previous wheel.

BAY STATE ABRASIVES

BAY STATE WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh, Los Angeles. *Distributors:* All principal cities.

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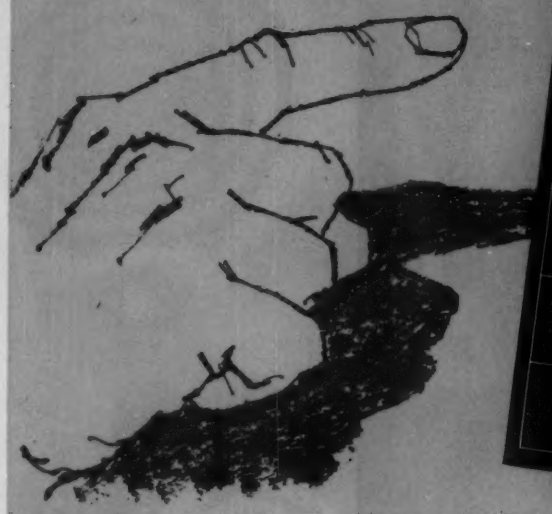
Why you can't afford cheap nozzles...



BORE OF NOZZLE IN INCHES	CU. FT. OF AIR PER MINUTE @ 80 LBS. PER SQ. IN.	H.P. REQUIRED TO MAINTAIN PRESSURE
3/8	191	34.76
13/32	225	40.95
7/16	260	47.32
15/32	299	54.42
1/2	340	61.88
9/16	430	78.26
5/8	532	96.82

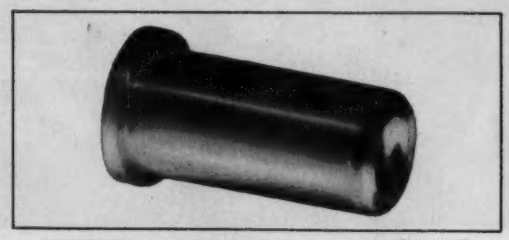
The chart tells the story.

Any pressure blast nozzle which wears rapidly greatly increases your compressed air bill. For example, when you start with a 3/8" bore nozzle at 80 lbs. blasting pressure, it will pass 191 cu. ft. of air per minute, requiring 34.76 H.P. However, when this nozzle has enlarged only 1/16" to 9/16" bore, you must supply 430 cu. ft. of air per minute to maintain the 80 lb. pressure. And you pay for 78.26 H.P. to develop this volume. And with ordinary nozzles, the difference between 3/8" and 9/16" occurs in only a few hours, or when manufactured abrasives are used, this can happen in a matter of minutes!

Now contrast the minimum guaranteed life of Norton NORBIDE* Pressure Blast Nozzles: 750 hours with silica sand . . . 1500 hours with steel shot or grit! Lined with light, tough Norton Boron Carbide — a compound exceeded in hardness only by the diamond — they maintain high-efficiency abrasive velocity *economically* throughout their life span.

Why blast away your profits with cheap nozzles? Get the most work out of both nozzle *and* air with NORBIDE Nozzles. Available with bores from 1/8" to 1/4"; lengths up to 6". For details write Norton Company, Refractories Division, 314 New Bond Street, Worcester 6, Mass.

*Trade-Mark Reg. U.S. Pat. Off. and Foreign Countries



NORBIDE Pressure Blast Nozzles cut air costs 10% to 20%.

NORTON

REFRACTORIES

Engineered . . . Rx . . . Prescribed

Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Electro-Chemicals — **BEHR-MANNING DIVISION:** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

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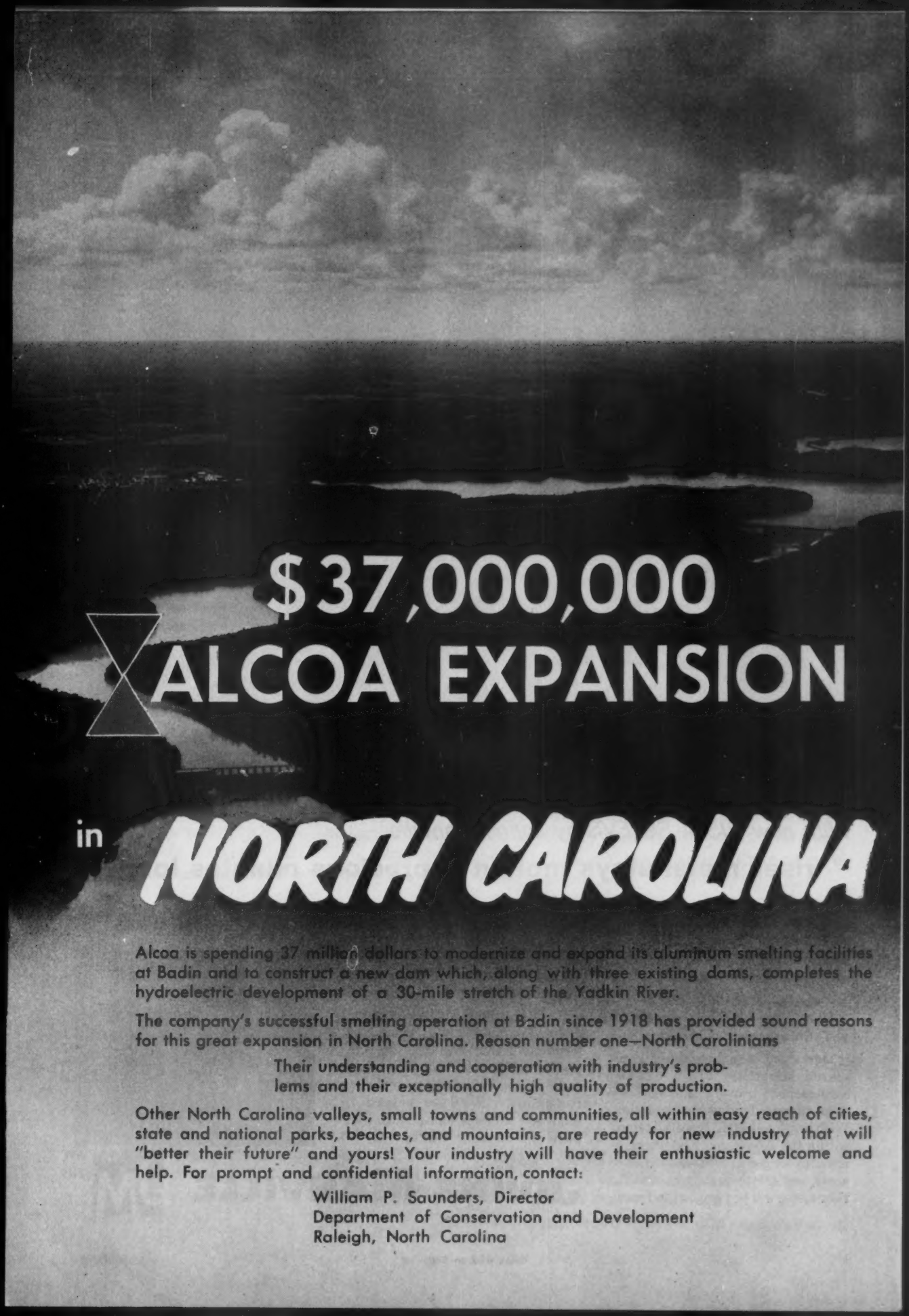


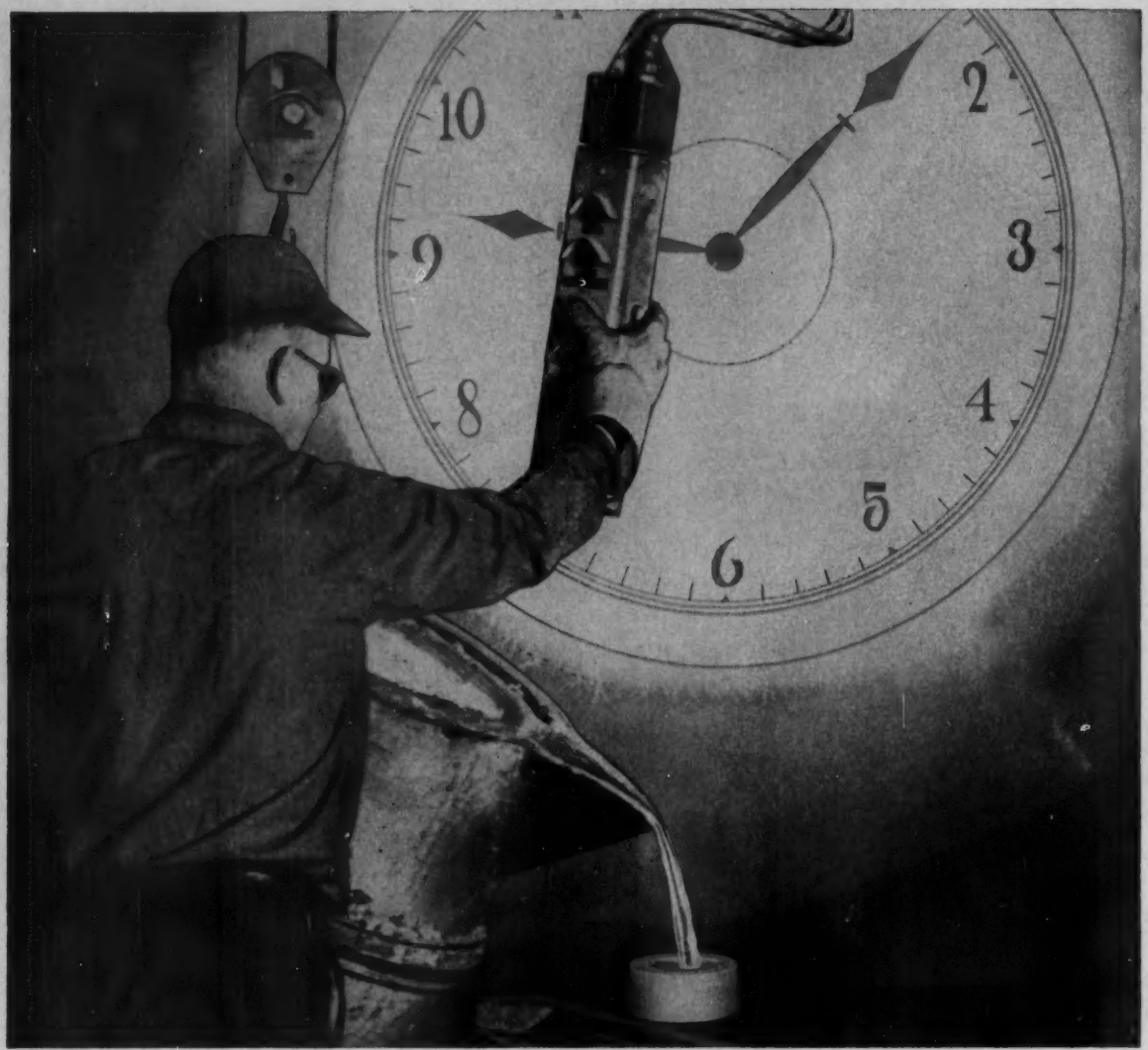
Alcoa is spending 37 million dollars to modernize and expand its aluminum smelting facilities at Badin and to construct a new dam which, along with three existing dams, completes the hydroelectric development of a 30-mile stretch of the Yadkin River.

The company's successful smelting operation at Badin since 1918 has provided sound reasons for this great expansion in North Carolina. Reason number one--North Carolinians

Their understanding and cooperation with industry's problems and their exceptionally high quality of production.

Other North Carolina valleys, small towns and communities, all within easy reach of cities, state and national parks, beaches, and mountains, are ready for new industry that will "better their future" and yours! Your industry will have their enthusiastic welcome and help. For prompt and confidential information, contact:

William P. Saunders, Director
Department of Conservation and Development
Raleigh, North Carolina



With new RIS-A-SLEEVS by Johns-Manville . . .

riser metal stays molten . . . precious minutes longer!

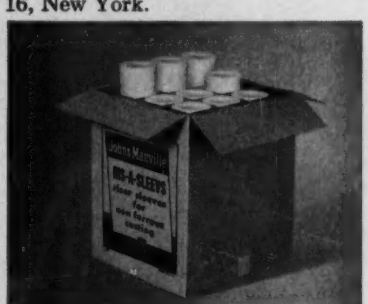
Now—for aluminum, brass and bronze casting—a new riser sleeve that contains heat more effectively than any product of its kind!

Here's the kind of riser sleeve you've long hoped would come along!

Developed by Johns-Manville research scientists, RIS-A-SLEEV reduces heat transfer as effectively as an advanced industrial insulation. With heat more effectively contained within the sleeve, you have precious minutes longer to feed small remote areas, and greater assurance that the riser metal will be very last to freeze.

Because RIS-A-SLEEV insulates better, it lets you cut down still further on riser sizes . . . gives you closer control of solidification . . . results in sounder castings and fewer rejects.

And, of course, RIS-A-SLEEV will not contaminate sand. It's ideal, too, for blind risers. Available in complete range of sizes . . . at surprisingly little cost. We invite you to test RIS-A-SLEEV. We'll be pleased to send you samples along with complete information. Write today to Johns-Manville, Box 14, New York 16, New York.



JOHNS-MANVILLE

JOHNS-MANVILLE JM PRODUCTS

POSITIVE DUPLICATION – EVERY TIME!

(PD)° Distinctive bullet markings occur every time a bullet leaves the same gun barrel. The barrel rifling grooves the slug, making possible *positive identification*—an important contribution to the science of ballistics.

CUT CLEANING COSTS

with CINCINNATI (PD) SNAGGING WHEELS. Take aim at your cleaning room costs. You'll be right "on target" with such wheels as the stand grinder wheels shown above. Let a highly trained and experienced CINCINNATI grinding specialist help you quickly determine the best grading for your stand, swing frame, and portable grinders.

KEEP COSTS CUT

Once you have the CINCINNATI (PD) WHEEL that gives you the lowest labor and wheel cost, you can be sure that every *reorder* wheel will act and grind exactly like the *original* wheel. The remarkable CINCINNATI (PD) manufacturing process gives you Positive Duplication . . . time after time after time. CINCINNATI (PD) WHEELS cut your costs . . . and *keep them cut*!

CALL CINCINNATI

For a CINCINNATI grinding specialist, to help you work down your cleaning room costs, call your CINCINNATI (PD) GRINDING WHEELS distributor, or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.

(PD) POSITIVE DUPLICATION

CINCINNATI°

GRINDING WHEELS

°Trade Mark Reg. U. S. Pat. Off.

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

CUPOLA DUST

AAF AMERclone system arrests dust—coarse and fine!

● It's the *little* particles of cupola dust—the ones cinder catchers miss—that create the *big* problems: employee health hazards, fire risks, damage to roofs and parked cars, higher insurance and maintenance costs, poor in-plant visibility, neighborhood complaints.

But large cinders and tiny particles alike are captured by the AAF AMERclone cupola dust control system. They're collected *dry*, simplifying disposal and eliminating corrosion of the collecting system. And one AMERclone handles two cupolas alternately, permitting full-time use of equipment.

AAF's complete line of dust control equipment was application-developed, now challenges *any* foundry dust problem. If *your* problem is cupola dust, contact your local AAF representative or write direct for Dust Control Bulletin 291. Address: Mr. Robert Moore, American Air Filter Co., Inc., 266 Central Avenue, Louisville, Ky.

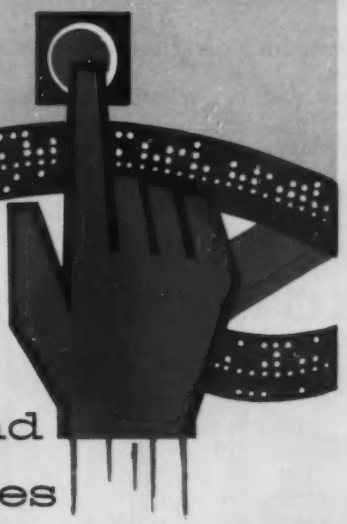
AAF **American Air Filter**

BETTER AIR IS OUR BUSINESS

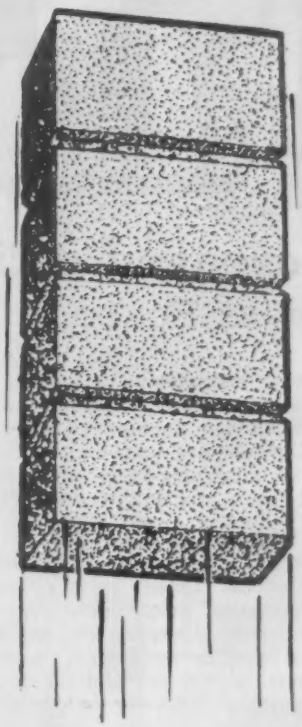
Circle 588 on Page 53

It doesn't take a computer to figure . . . .

Famous CORNELL CUPOLA FLUX



saves much more than its small cost! for Gray Iron and Malleable Iron Foundries



Here's why! Famous Cornell Flux is a scientifically blended mixture of fluorspar and other selected ingredients which react chemically in molten metal, purifying it and giving carbon constant! This is the fluidizing action foundrymen want and get when they ask for Famous Cornell Cupola Flux. If you don't have a UNIVAC handy, take our word for it: try Famous Cornell Cupola Flux, or write for Bulletin 46-B.

IF you melt aluminum, copper or brass, try Famous Cornell Aluminum, Copper or Brass Flux. Write for Bulletin 46-A.

often imitated but never equalled!

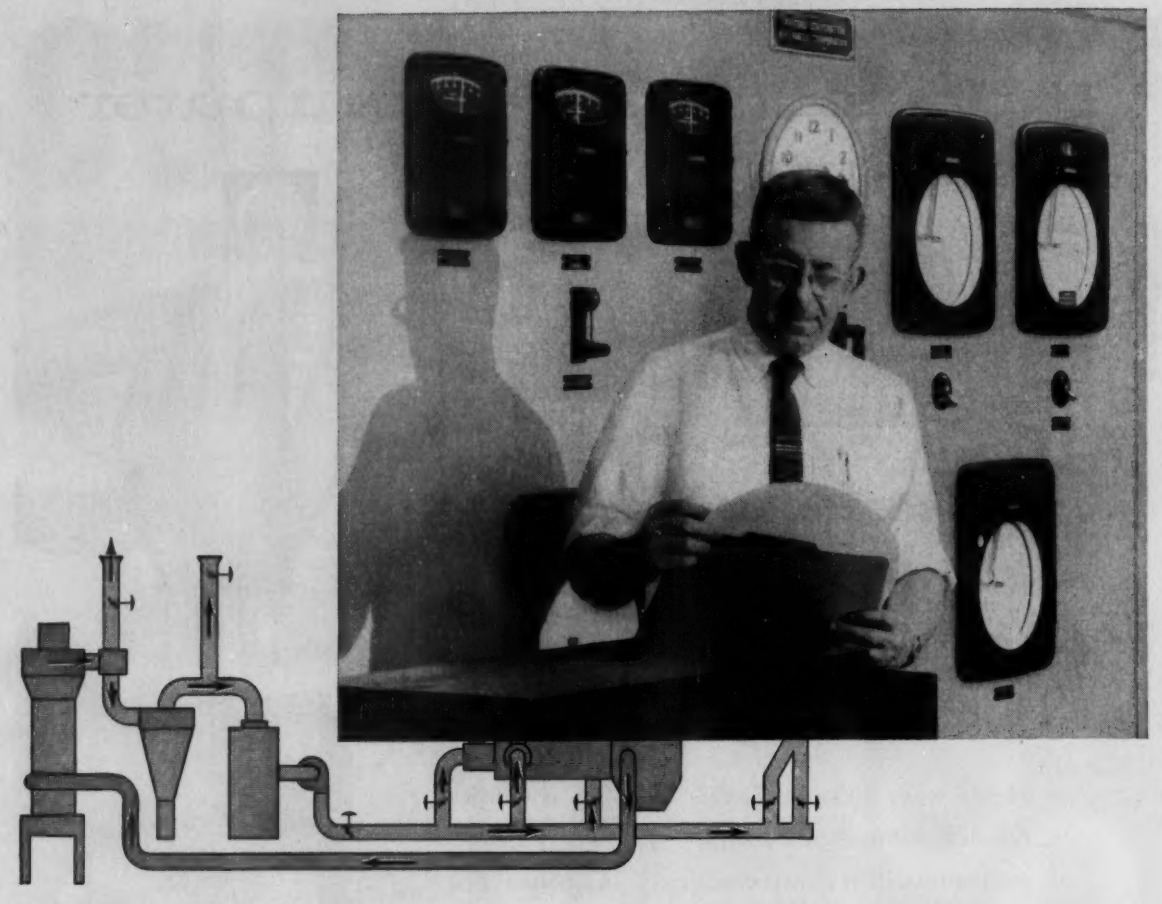
The **CLEVELAND FLUX** *Company*

1026-40 MAIN AVENUE, N. W. • CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes—Since 1918

FAMOUS CORNELL FLUXES

Trade Mark Registered



Increased efficiency, lower operating costs

with Foxboro Complete Hot Blast Cupola Control

Complete instrumentation for any Hot Blast Cupola system — simple or complex. And every instrument one that's been field-proved in hundreds of foundry installations. Ask your nearby Foxboro Field Engineer for full details on the cupola control instruments listed below — or write Foxboro direct.

Air Weight Controllers
Performance-proved in more than 1700 successful installations. These popular Foxboro Controllers automatically "weigh" air for cupola blast... provide right amount of oxygen for best combustion regardless of weather conditions. Results: higher quality castings, greater productivity . . . fuel savings and less pigging. Write for Bulletin 10-10.

Dew Point Recorders – Controllers
These Foxboro Instruments, with the exclusive Dewcel* measuring element, reduce coke waste and "cold metal" pours. Dew Point Recorders provide a fool-proof basis for modifying the formula under varying humidity conditions. Dew Point Controllers automatically compensate for blast moisture variations on long-run heats. Write for Bulletin 11-11.

Pressure Recorders
These "trouble-shooting" recorders give operators a continuous record of cupola conditions . . . show-up clogged tuyeres, bridging, fine coke sizes, etc. They're dependable, accurate, trouble-free performers. Write for Bulletin 6-10.

Temperature Controllers
For precise control of cupola start-up operation, windbox blast air, dust collector inlet gas, and hot air generator exhaust gases. Write for Bulletin 14-10.

Other Foxboro efficiency boosters: Blast Pressure Recorders • Temperature Controllers for Pre-Heaters Pressure Controllers for Exhaust Systems • Temperature Protection for Fans and Dust Collectors.

The Foxboro Company, 3211 Neponset Avenue, Foxboro, Massachusetts.

*Trade Mark

FOXBORO
REG. U.S. PAT. OFF.

COMPLETE FOUNDRY INSTRUMENTATION

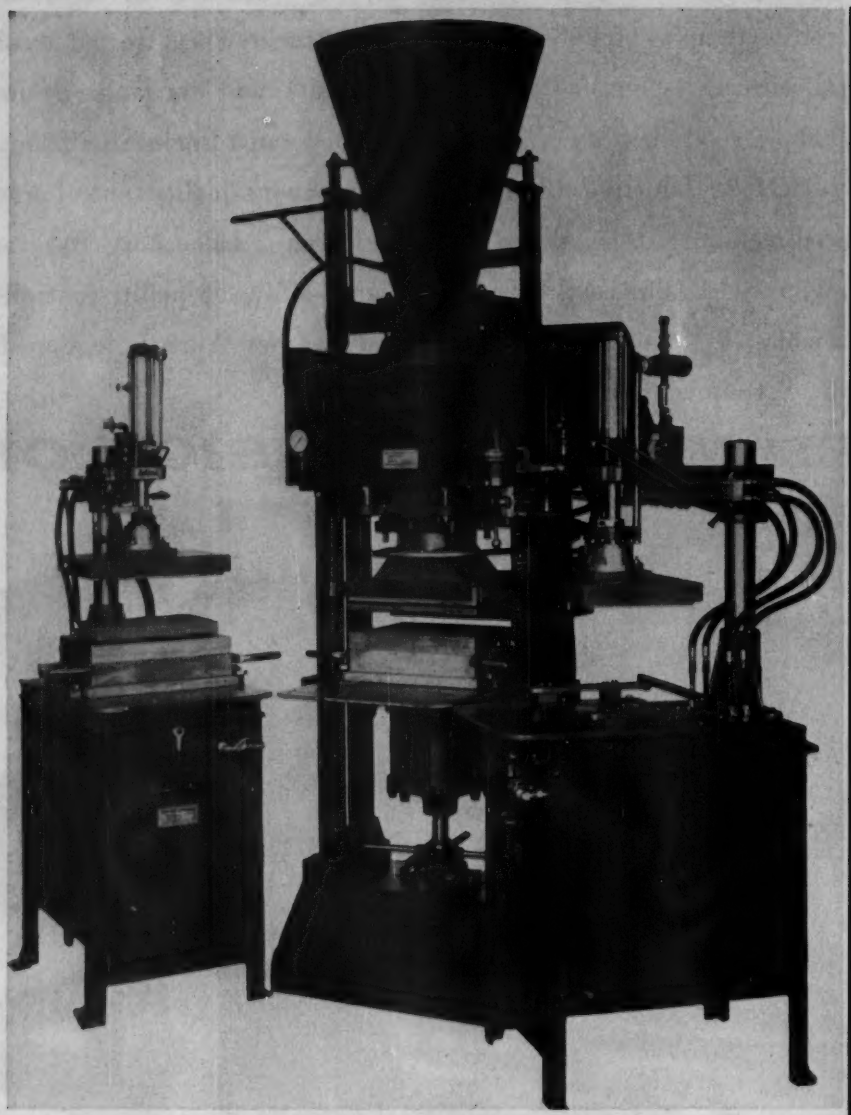
Circle 590 on Page 53
Circle 591 on Page 53→

For truly engineered, truly trouble-free bronzes, specify Federated Silicon Bronzes (50% better ductility, tensile strength up to 65,000 psi); Aluminum Bronzes (heat treated, tensile strength as high as 120,000 psi, with correspondingly high yield strength); and Manganese Bronzes (as-cast tensile strength 125,000 psi, good ductility, high hardness). Federated Engineered Bronzes are the end results of highly perfected production techniques and continuous quality control procedures developed by experienced metallurgists in Asarco's Central Research Laboratory. Ask your Federated field man about Engineered Bronzes and Federated's complete line of quality-controlled copper base casting alloys. Federated Metals Division, 120 Broadway, New York 5. In Canada: Federated Metals Canada, Ltd., Toronto and Montreal.

FEDERATED METALS DIVISION OF

ASARCO

AMERICAN SMELTING AND REFINING COMPANY



REDFORD CO_2 MOLD MAKING EQUIPMENT

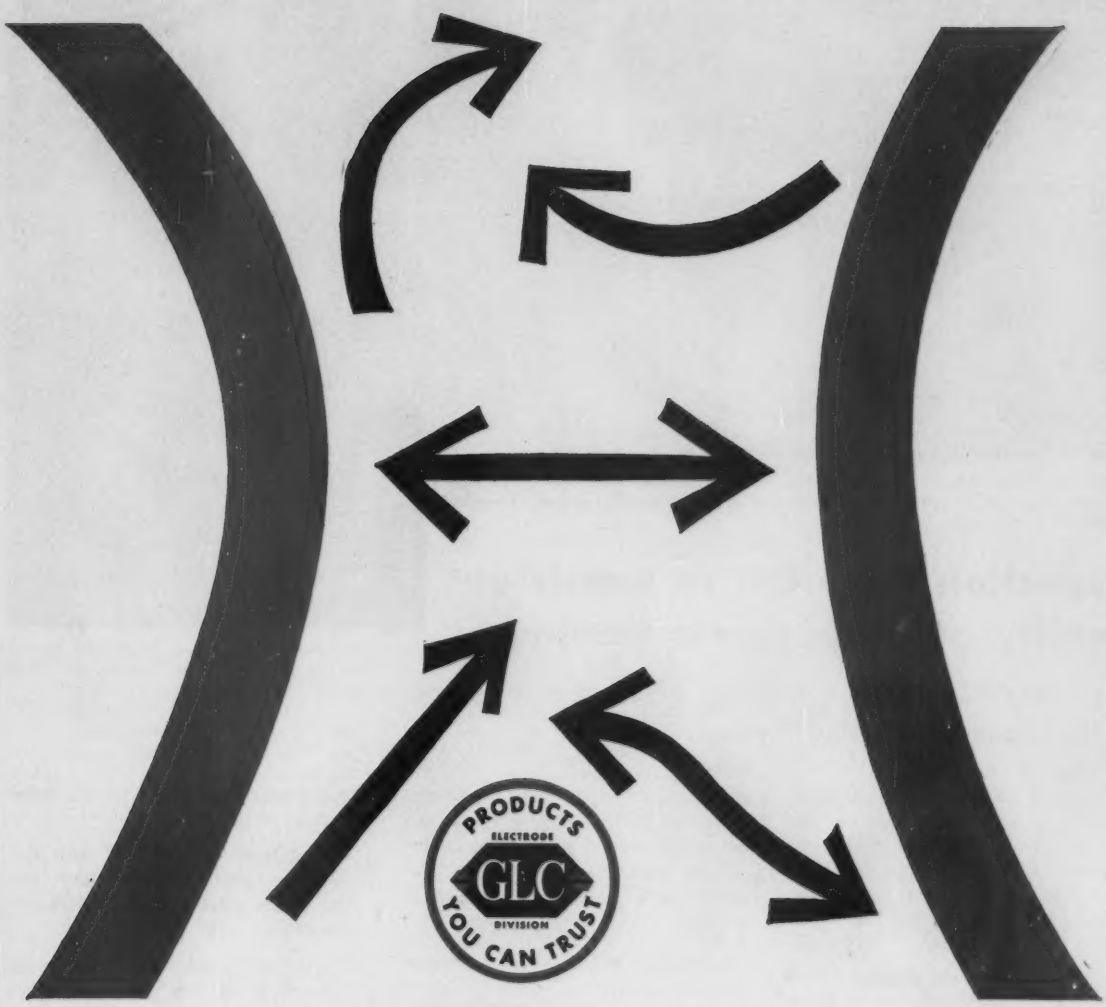
Here is a proven way of applying the CO_2 process to the production of small castings. With the above Redford #420-D Core Blower and (2) Model H-2-M Gassing Stations, one mold is being blown and squeezed while another one is automatically gassed and stripped. Up to 80 complete molds (cope and drag) are produced in one hour. Molds are flat and can be stacked for pouring. Metal yield is greatly increased. Very little floor space is required. Millions of small parts have been cast to close tolerances at reduced costs. For complete information write for BULLETIN No. 421.

Redford IRON & EQUIPMENT CO.
20733 Glendale • Detroit 23, Michigan
Phone: KEnwood 1-8611

TYPICAL CO_2 MOLD CASTINGS

½ Actual Size

Circle 592 on Page 53



CLOSE COOPERATION

• • • with melt shop personnel by GLC service engineers is one of the reasons for the outstanding performance of GLC electrodes. Don't hesitate to avail yourself of this service.

GREAT LAKES CARBON CORPORATION

18 EAST 48TH STREET, NEW YORK 17, N. Y. OFFICES IN PRINCIPAL CITIES

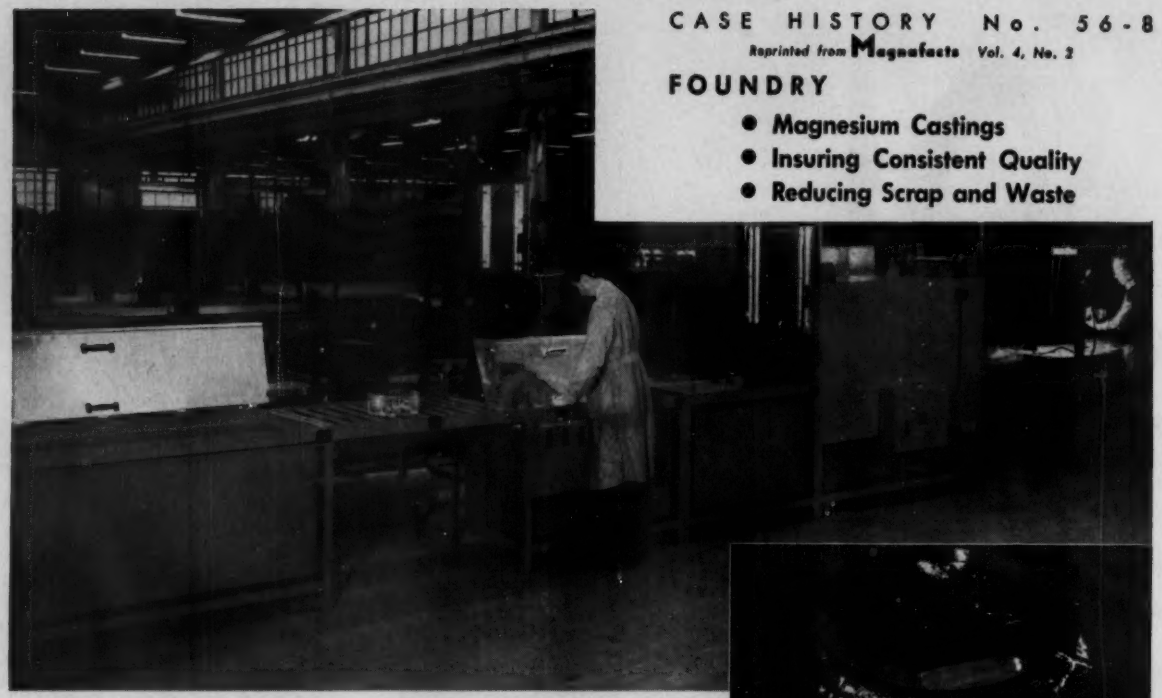
Circle 593 on Page 53

CASE HISTORY No. 56-8

Reprinted from Magnafacts Vol. 4, No. 2

FOUNDRY

- Magnesium Castings
- Insuring Consistent Quality
- Reducing Scrap and Waste



Through this Type ZA-29 Zyglo Unit, parts flow in a 5-step inspection, beginning with application of penetrant at extreme left, and ending with inspection under black light at the right.

Shrinkage porosity in a magnesium casting as revealed by Zyglo. Finding the cause helps provide the cure.

Inspection Pays Off in Consistent Quality of Magnesium Castings

Magnaflux' Zyglo Also Reduces Scrap and Waste at the Magnesium Alloy Products Co.

If a typical, progressive foundryman could hang just one motto on the wall, it would probably be, "Aim for *Consistent* Quality". He doesn't mean "perfection" — he means that every casting produced should be job-worthy for its purpose.

The Magnesium Alloy Products Co., of Compton, California, is a good example of what such an aim can accomplish. Through modern processes and a well planned inspection system centering around Zyglo Fluorescent Penetrant Inspection, it has achieved high consistent quality, while reducing scrap losses and waste.

"To prevent excessive scrap from occurring," explains L. M. Nash, Metallurgist for the company, "it is necessary for the inspection department to catch a faulty casting as soon as possible—first, to isolate it so that no further labor or time will be wasted on it; and second so that the quality control department can make corrections before too many castings are poured.

"An average molder with an average squeezer pattern will produce about six molds an hour. The pouring, cooling and shakeout will require about 30 minutes, so that by the time the first casting reaches the first or 'hot inspection' there are probably four to six molds already made.

"If this casting contains a flaw that is not seen by the inspector, it may be several hours before the trouble is found at a later inspection point. It is therefore vitally important that the inspection department be given every facility needed to locate trouble spots as soon as possible.

"The defects we look for with fluorescent penetrant inspection are cold shuts, cracks, blows, shrinkage, and dross.

"Zyglo inspection has many advantages to fit our inspection needs at Magnesium Alloy Products Co. The cost of material used per casting is low and the process fast enough to keep up with production and give us quick and accurate answers. And there is no objectionable residue left on the castings to interfere with subsequent operations.

"The final big advantage to us, of course, is that besides reducing scrap, lost time and waste, we are now able to turn out a better quality casting."

FOR YOU, *TOO—Magnaflux Test Systems can help to increase the yield of usable castings — and foundry profits! See your MX Engineer or write for details*

THE HALLMARK OF QUALITY IN NONDESTRUCTIVE TEST SYSTEMS

MAGNAFLUX CORPORATION

7350 W. Lawrence Ave., Chicago 31, Illinois

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- To request extra copies of editorial articles

FOUNDRY November 1959

401	421	441	461	481	501	521	541	561	581	601	621	641	661	681
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No Postage Stamp Necessary If Mailed in the United States
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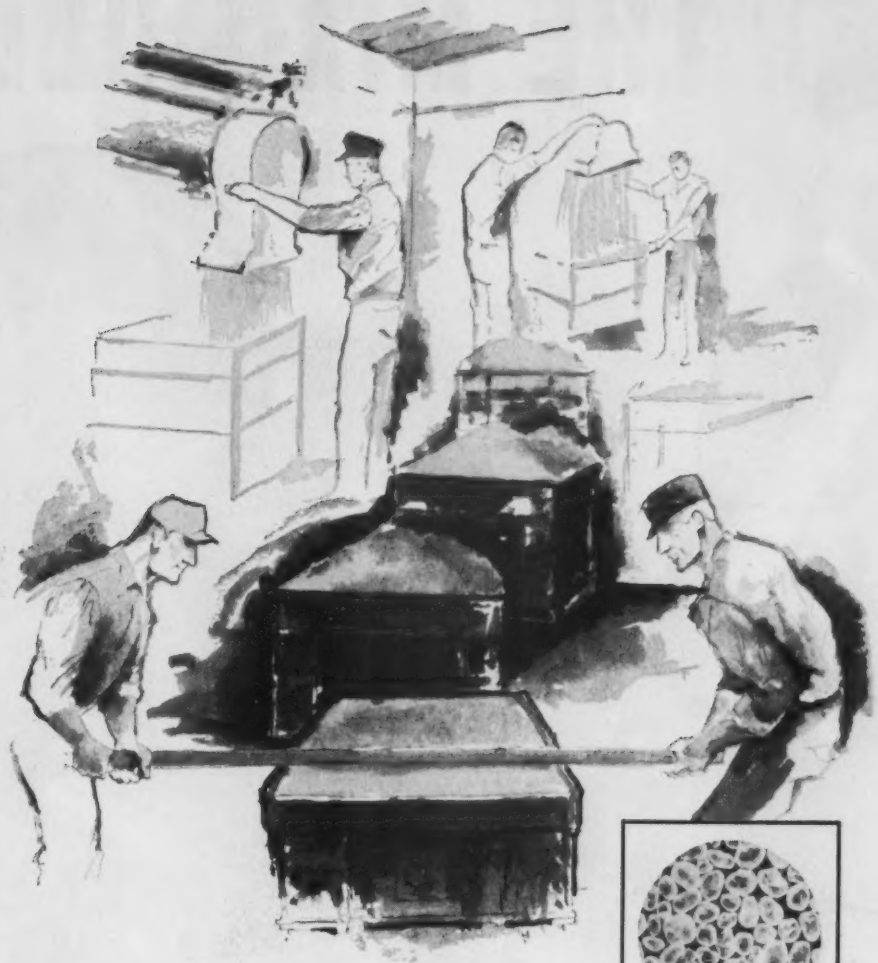
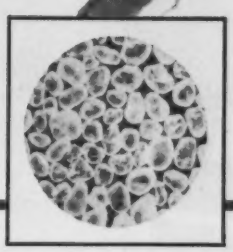




ALL THE MERITS OF ROUNDED-GRAIN QUALITY ARE YOURS WITH WEDRON SILICA...

New casting techniques produce more accurate castings that require less machining. This is the new money-saving dimension in industry that demands finer foundry sands. Wedron's pure rounded-grain is the answer, in case after case where other sands fail. Where accuracy is demanded, Wedron Silica can meet all specifications and give outstanding results. Make your next order pure, uniform rounded-grain sand from Wedron.

WEDRON SILICA COMPANY

135 South LaSalle Street • Chicago 3, Illinois

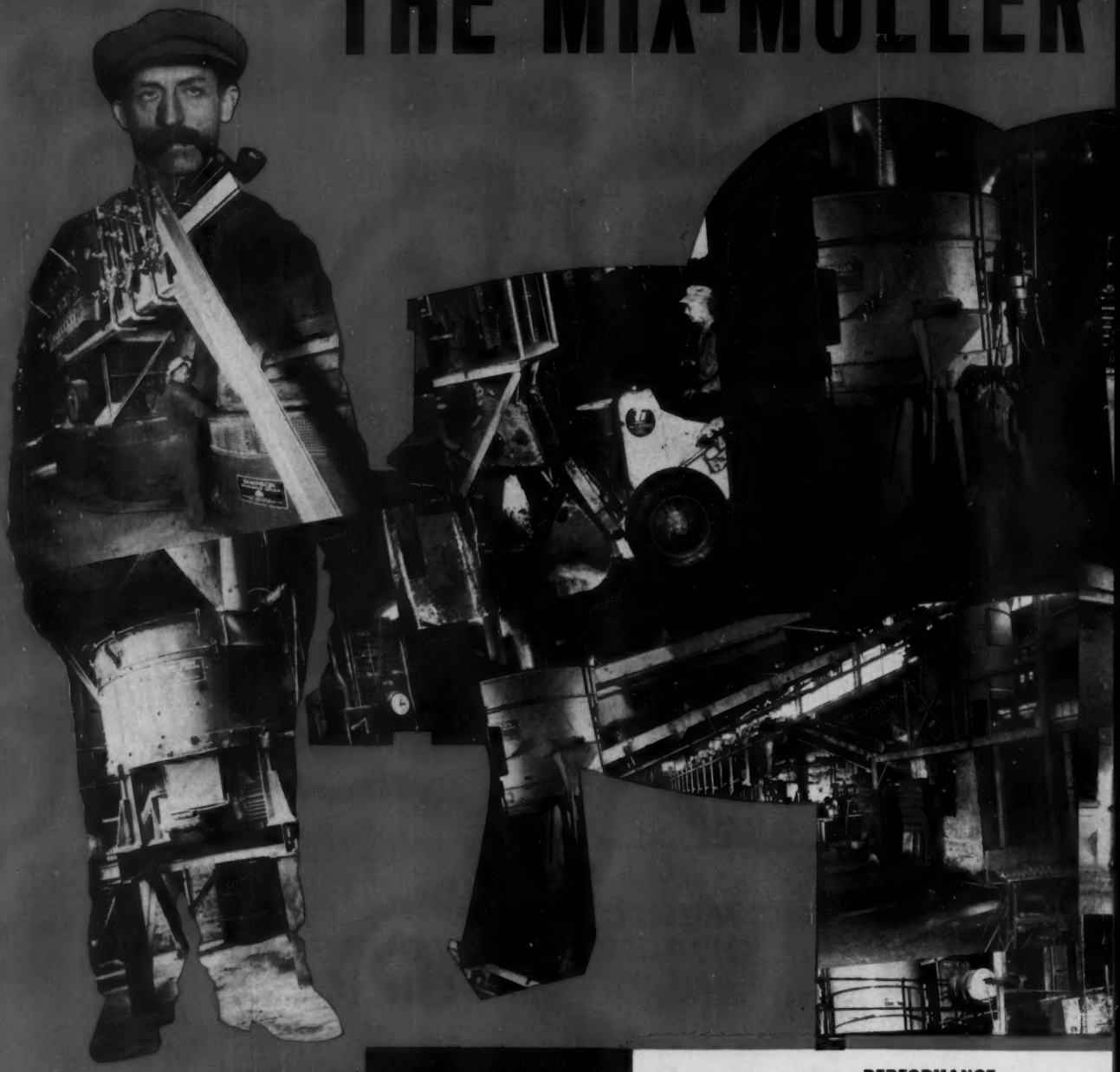
Send for illustrated brochure on Wedron sands.

99.9% PURE SILICA WEDRON SILICA COMPANY INDUSTRIAL SANDS

MINES AND MILLS IN THE WEDRON-OTTAWA DISTRICT

Circle 595 on Page 53

THE MIX-MULLER



TRADE UP!

Meet the production challenge of the '60s with F Series Mix-Muller

IF YOUR SIMPSON MIXER IS OVER 20 YEARS OLD A MODERN F SERIES MIX-MULLER CAN DELIVER:

- 67% greater Batch Capacity
- 100% more Hourly Production
- 30% more Mulling Efficiency

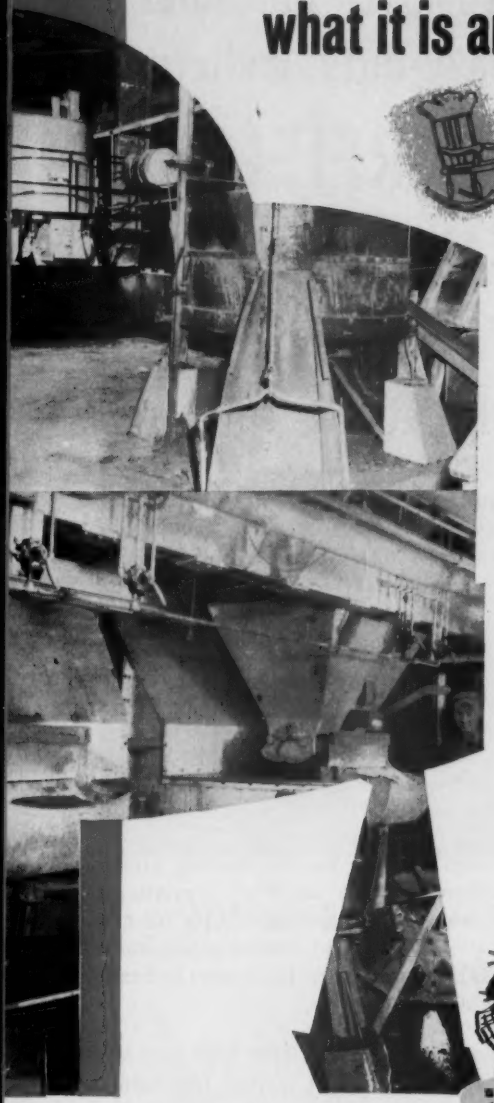
PERFORMANCE

	1930 Simpson	Model F Mix-Muller	
Batch Capacity	1200 lbs. (max.)	2000 lbs. (min.)	67% more
Output Per Hour (G.I. Mold.)	12 tons (max.)	24 tons (min.)	100% more
Discharge Time	40 seconds	20 seconds	50% less
Mulling Efficiency	On basis of time required to develop sand characteristics compatible with modern foundry practice overall 2F efficiency is about . . .		30% greater
Equipment Cost (Per Ton/hr. of Sand Prepared)	Based on present day prices, the 2F Mix-Muller will turn out 100% more sand per hour at an equipment investment amounting to . . .		31% less cost per ton/hr.

MORE PRODUCTION

RETIREMENT PLAN

what it is and how it benefits Mix-Muller users



If your Simpson Mix-Muller was built before 1951, you can now *trade it in* as you would your automobile.

Why a retirement plan? Simply this. There is no comparison between the production efficiency of a 20-year-old Simpson machine and a 1960 F Series Mix-Muller! Many satisfied users are operating Simpson machines which *paid for themselves* over a decade ago. Maintenance and repairs may be negligible on these sturdy mixers. But in the decade since amortization, such a machine may well have *cost* its owner the price of an F Series Mix-Muller . . . in the increased hourly production and overall efficiency he *could* have had, with a modern F Series Mix-Muller.

This is not planned obsolescence . . . it is calculated *progress*. The charts below reveal how a 1960 F Series Mix-Muller *performs* better, is *built* better and is easier to service and operate than *any* muller you may now operate.

The Mix-Muller retirement plan is especially designed to make your transition to an F Series Simpson Mix-Muller easy and economical. Ask your NATIONAL man about it, or write for details.

NATIONAL ENGINEERING COMPANY
646 Machinery Hall Bldg., Chicago 6, Illinois

SIMPSON MIX-MULLER

CONSTRUCTION:

	1930 Simpson	Model F Mix-Muller
Muller Suspension	Rocker arms. 3 weights of mullers 700, 1000, 1600 lbs. Manual adjustment. Non-reversible.	Spring loaded—automatically adjusts to provide more pressure as sand increases in strength. Reversible.
Discharge Door	Hand fitted. No adjustment for wear.	Machined to close tolerance and equipped for wear adjustment. 100% larger opening.
Bearings	Sleeve.	Anti-friction throughout.
Drive	Open bevel, direct connected.	V-belt, self-contained, splash lubricated reducer.

SERVICE AND OPERATING:

	1930 Simpson	Model F Mix-Muller
Lubricate	5 alemite fittings.	"One stop" centralized system for all interior components.
Plow Adjust	Wrench and hammer, from inside crib.	Can be adjusted from top of cross head.
Overhaul	Roll up sleeves. Crawl in mixer.	Roll out mullers and/or turret assy. through removable crib section—without dismantling hoods, hoppers, etc.

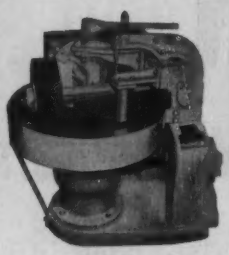
WHO'S GOT HANDLEBAR HARRY?

ANY MIX-MULLER USER can enter and win a prize in National's $5000 contest. Write for an entry blank.

BETTER BUILT EASIER TO SERVICE

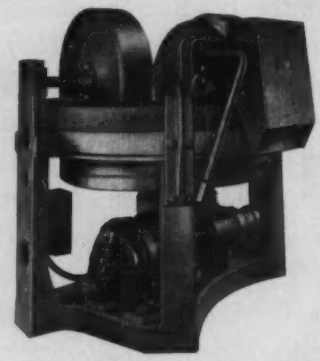
F1059

Circle 596 on Page 53

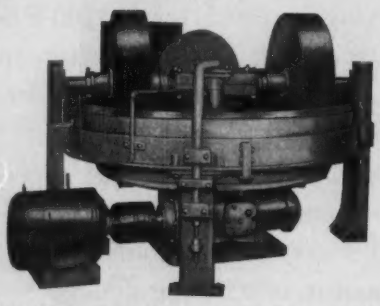


No. 251 2½-ft. diameter ....½ to 1 cu. ft. batch

No. 414 4-ft. diameter .....2 to 4 cu. ft. batch



No. 610 6-ft. diameter....10 to 14 cu. ft. batch



No. 715 7-ft. diameter....15 to 20 cu. ft. batch

No. 930 9-ft. diameter....30 to 40 cu. ft. batch

ANY SIZE MADE TO YOUR SPECIFICATIONS

From compact portables to heavy-duty mullers

CLEARFIELD CAN SUPPLY THE RIGHT MIXER FOR YOUR JOB

Clearfield Mixers are available in capacities ranging from ½ to 40 cu. ft. . . . for batch or continuous mixing. They're constructed of rugged cast iron for strength, rigidity and wear resistance. And all Clearfield mixers feature the "revolving pan" mixing principle which keeps the material in *constant* state of violent motion; this eliminates the "lag" intervals which result in mixers with mullers and scrapers that revolve instead of the pan. With Clearfield revolving-pan mixers you get a constant controlled-course mixing action which assures a better balance of blending and tempering.

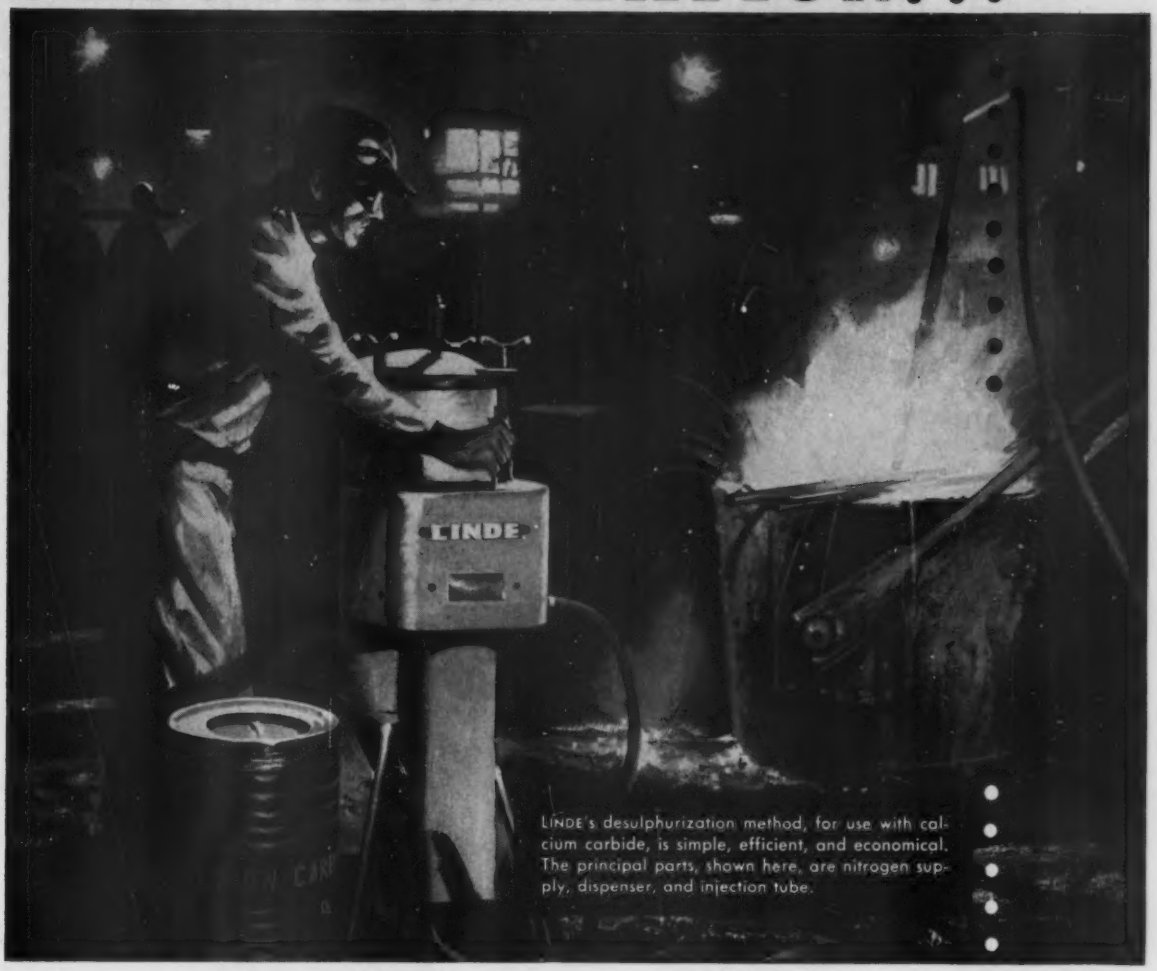
Whether you need a mixer for maintaining proper bond and moisture in heap sands . . . preparing facing sand or core sand for castings . . . or for any foundry application where sand control is important . . . Clearfield Mixers can do the job better, and save you production money.

Let us help you determine the best type and size for your particular needs. No obligation. Meanwhile, send for Catalog No. 90.

CLEARFIELD MACHINE COMPANY

CLEARFIELD, PENNSYLVANIA, U.S.A.

DESULPHURIZATION...



LINDE's desulphurization method, for use with calcium carbide, is simple, efficient, and economical. The principal parts, shown here, are nitrogen supply, dispenser, and injection tube.

You get uniform results with Metallurgical Carbide from LINDE

In the foundry, you can produce high grade iron only by making sure you use metal with a low sulphur content. As a desulphurizing agent, metallurgical calcium carbide assures *uniformity* in the metal you produce. You know in advance that by adding a certain amount of carbide you remove a certain percentage of sulphur. Because metal specifications can be met efficiently and economically with carbide, you eliminate any need for wasteful "trial and error" methods.

Linde's method of mixing UNION calcium carbide and molten iron is simple and sure. A stream of fine mesh carbide and nitrogen under pressure is forced from a dispenser through a hose. The graphite injection tube is immersed deep in the hot metal. The carbide blends evenly and thoroughly with the iron. Desulphurization with UNION calcium carbide creates no fumes, does not attack refractories. The LINDE equipment—nitrogen supply, dispenser, and injection tube—is easy to operate and maintain.

If you would like more information about LINDE's method of desulphurization, using calcium carbide, just call or write your nearest LINDE office. LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. Offices in other principal cities. In Canada: Linde Company, Division of Union Carbide Canada Limited.

Linde
TRADE-MARK

UNION CARBIDE

The terms "Linde," "Union" and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

Circle 598 on Page 53

in the fine FANNER LINE

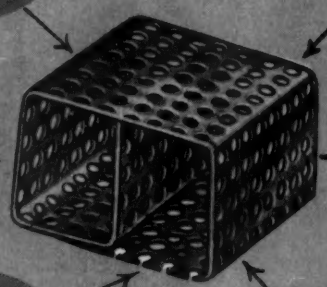
FOR
LIGHT
CASTINGS

PERFORATED CHAPLETS
in a wide range of sizes

LARGE SUPPORT AREA
Holds core more securely in place.

FLEXIBLE SHAPE
10 styles fit any shape or contour—flat, curved, wedge-shaped, bridged or with extended ends.

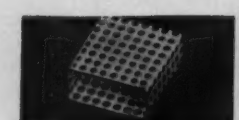
PERFORATIONS
Large number of perforations in light metal insure perfect fusion in light castings.



WILL NOT CHILL
Large perforated area eliminates concentration of metal at any point to chill and cause leaks.

PERFECT VENT
No gas or air pockets to cause "blow-holes", thus perfect ventilation is secured.

ACCURATELY MADE
Produced to exacting standards on specially designed machines to meet specifications.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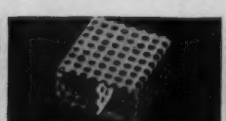
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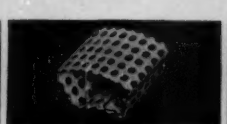
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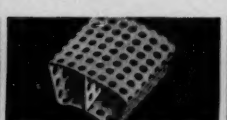
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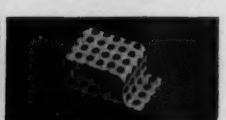
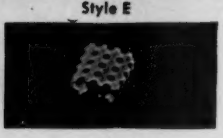

Style E

Style F

Style G

Style H

Style I


Style J

TYPICAL APPLICATIONS

MANIFOLD

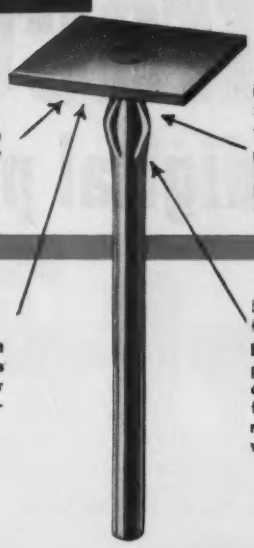
STOVE

Fine FANNER Perforated Chaplets are the perfect answer for many casting applications where there is no need for heavy core support. Their lightweight, wide support area and readily shaped contours, in addition to their many other features make them almost universally adaptable. They are made of tin-coated sheet steel for ferrous castings; and of aluminum, copper or brass for use in castings of these metals—in 38 sizes from ⅛"x ¼"x ¼" to 1" x 2" x 2". Write for catalog

there's the perfect chaplet for every need

FOR
HEAVY
CASTINGS

WROUGHT IRON FORGED OR FITTED
single head chaplets



SPECIAL FORM-FITTING HEADS
Formed to specification to fit cores of almost any desired shape.

COUNTERSUNK SHOULDER
Tapered Fanner design provides more complete contact with molten metal by eliminating corners where gas pockets form.

HEAVY SHOULDER
Extra-heavy construction at shoulders provides maximum support for heavy cores without excess of metal.

SUPERSTEM CONSTRUCTION
Broad angle Superstem provides extra strength and greater fusion area for molten metal. Furnished with Groovestem when specified.

NON-SLIP HEAD
Prevents side-slipping, provides more rigid support when in place.

FORGED HEAD
Upset in forging to three times stem diameter, extra strength offers greatest support to core.

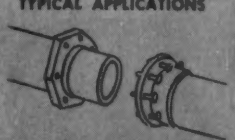
WROUGHT IRON FITTED SINGLE HEAD CHAPLETS
Round or Square Heads — Curved, Angled or Straight
Available with Superstem or Threaded Stem

WROUGHT IRON FORGED SINGLE HEAD CHAPLETS
Available with Superstem or Threaded Stem

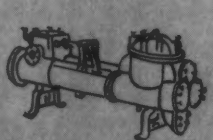
These two types of FANNER Chaplets can be depended upon to handle the heaviest cores. Seven head sizes and stems from 3" to 20" are available for immediate delivery. Remember, when you standardize on FANNER, you always get exactly the right chaplet for every need!

THE FANNER MANUFACTURING COMPANY
Designers and Manufacturers of Fine Fanner Chaplets and Chills
BROOKSIDE PARK CLEVELAND 9, OHIO

TYPICAL APPLICATIONS

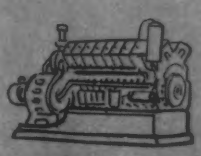


SOIL PIPE

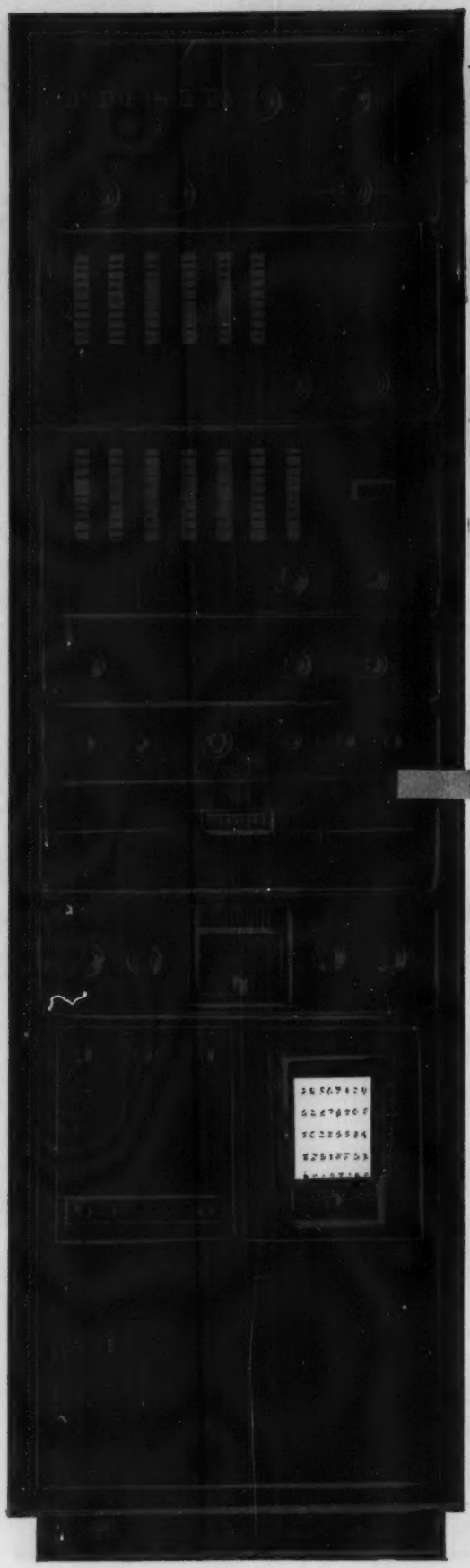


HEAVY DUTY PUMP

HEAVY TRACTOR



DIESEL MOTOR



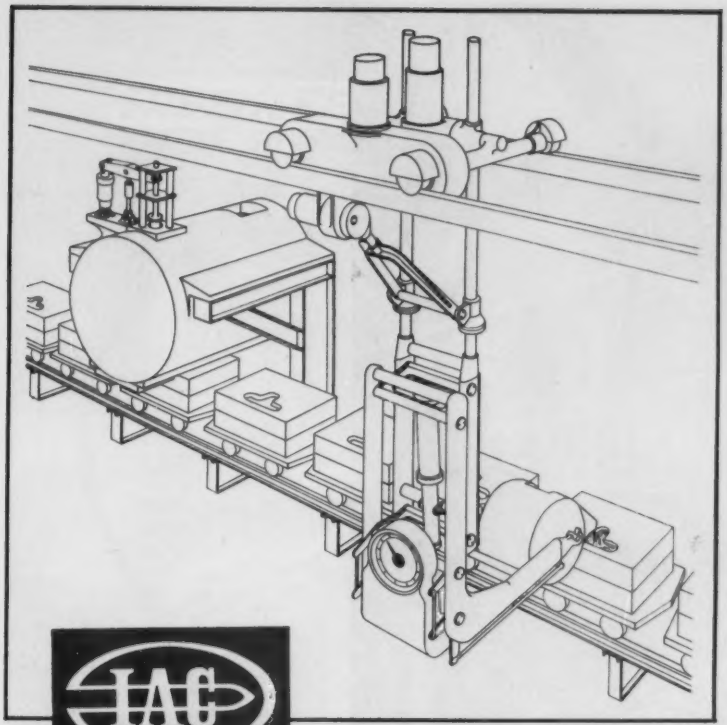
new PICKER electronics for diffraction with digital printout

into this fine equipment have gone all the design skills which distinguish Picker medical and industrial x-ray equipment.

behind it stands the Picker service organization—a nationwide network of local sales and service depots staffed with trained engineers—to assure dependable performance and uninterrupted functioning.

Get the story from your local Picker man. There's probably a District Office near you (see local phone book) or write Picker X-Ray Corporation, 25 South Broadway, White Plains, New York.

Picker nuclear



this fully automated pouring device

Saves manpower and metal

Improves casting yield

Reduces scrap losses

Assures perfect pouring rate control

Eliminates the "human element"

IAC

PRESENTS THE FULLY AUTOMATIC POURING DEVICE

(Patents Pending)

POURMATIC

The POURMATIC has been developed specifically for the high production foundry. Successfully tested for 3 years in a modern automated malleable iron foundry, it provides the latest advancement in foundry automation and pouring technology. You will be interested in the substantial savings which this automatic pouring method can bring to your operation. Write today for further details.

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121 HURON VIEW BLVD., ANN ARBOR, MICHIGAN

Phone NOrmandy 2-1342

Fill out, tear out, and mail this coupon today

INTERNATIONAL AUTOMATION CORPORATION

Gentlemen:
Please send me further information on the I.A.C. POURMATIC

NAME .....

TITLE .....

COMPANY .....

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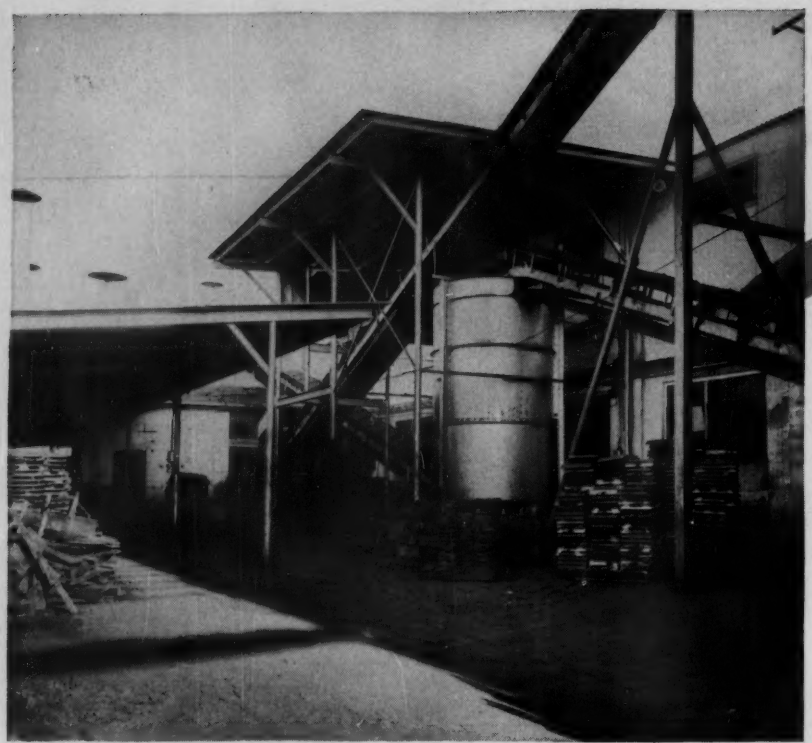
Circle 601 on Page 53

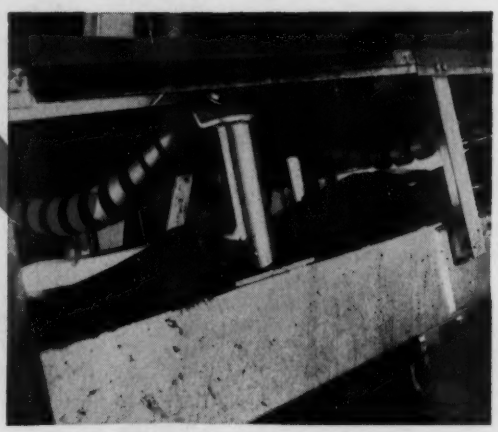


UP TO 10 TIMES THE SERVICE LIFE OF STEEL IDLERS . . . The Joy Limberoller® Conveyor Idler

After more than five years of service on foundry sand conveyors, Joy Limberoller idlers have proved they outlast steel idlers as much as ten to one.

The reason for this amazing record is the unusual design of the Limberoller. Instead of having 6 bearings, as a steel idler, the Limberoller has just two. These are mounted at both ends of a flexible wire rope, to which neoprene discs are molded. The bearings are up out of the sand, unaffected by spillage. Fouled bearings, which stop steel idler rolls and cause damage to the belt, are never a problem. Belt life is increased and maintenance costs go down to almost nothing.

Join the foundry management men who have ended their sand conveyor problems by replacing steel idlers with Joy Limberollers. We'll be glad to give you all the details. Write for Bulletin 347-13.



EQUIPMENT FOR ALL INDUSTRY

JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

Circle 602 on Page 53

Greenlee Core Machines in Greenlee Foundry

Foundrymen: Mechanize your Core Line Production with GREENLEE Core Rollover and Draw Machines

CORE ROLLOVER MACHINE
Clamp, rollover and roll back cycle time is 45 seconds.

CORE DRAW MACHINE
Positions, clamps, vibrates, draws core boxes to 32" deep in 80 seconds.

. . . Increase daily core production
. . . Reduce box and core damage
. . . Permit use of lighter, less expensive core boxes

Greenlee Core Rollover and Draw Machines pay large dividends in high speed, economical core line production. These machines are capable of handling 50 cores per hour. Compare your present method with this production time! Greenlee Core Rollover and Draw Machines provide the flexibility needed for large and small core production.

Standardization of core box sizes is unnecessary . . . use your present boxes. Lighter, inexpensive core boxes can be used because hammering, crane handling and log chain damage is eliminated. Greenlee Core Machines can help you produce better cores faster, more economically.

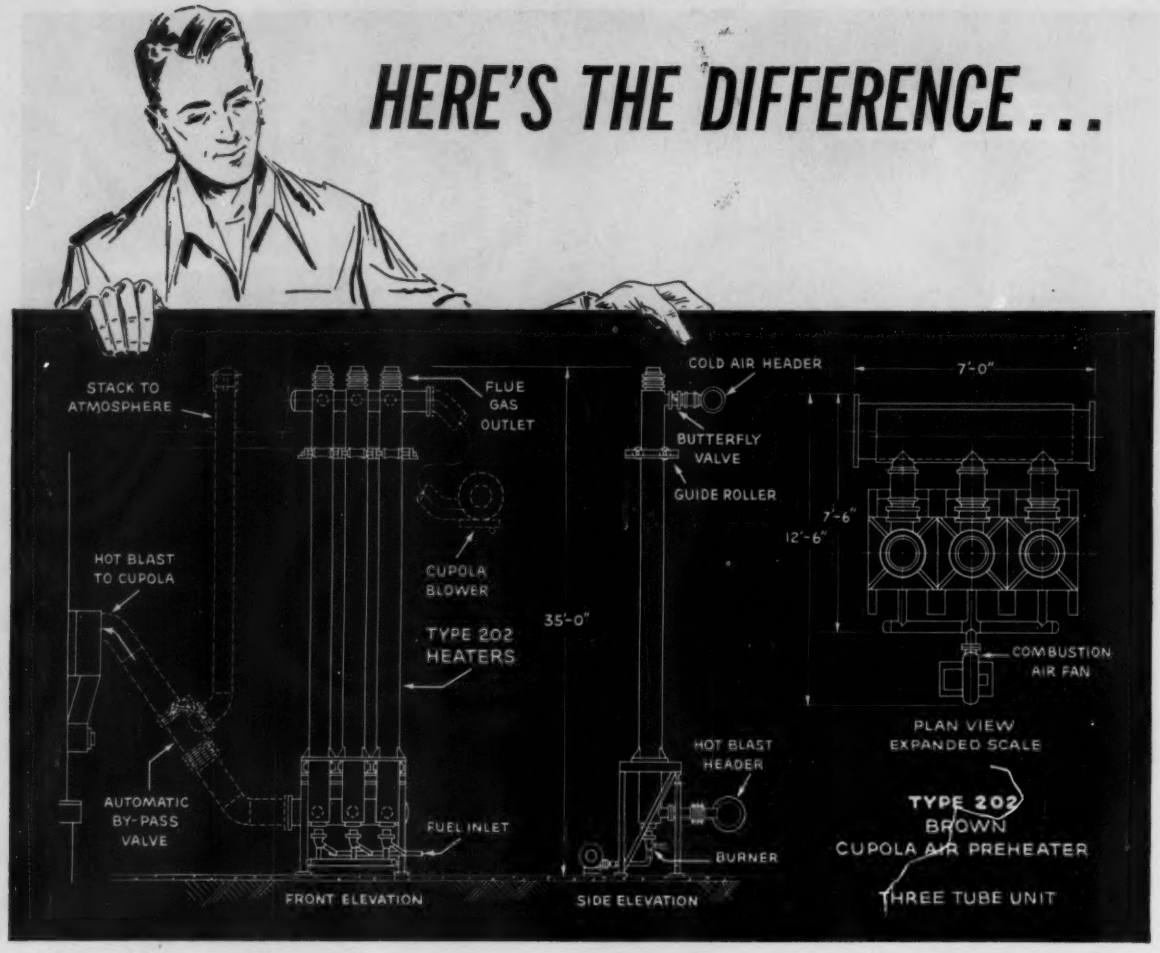
WRITE FOR BULLETIN F-101 — YOU'LL GET COMPLETE DETAILS ON GREENLEE CORE MACHINES

Machines designed with the future in mind.

GREENLEE BROS. & CO.

1700 MASON AVE.
ROCKFORD, ILLINOIS

Circle 603 on Page 53



Brown Hot Blast Cupola Equipment is designed by *HEAT TRANSFER SPECIALISTS*

In many ways Brown Hot Blast Cupola equipment is the finest air preheater yet developed for foundry cupolas! The returns this system offers result from Brown's *exclusive specialization in designing and fabricating heat transfer equipment.* The entire engineering know-how and service of the single-purpose Brown organization has concentrated for 20 years on thermal equipment. Our energies are never diverted by the necessity of producing a wide range of equipment.

Brown hot blast air heaters give accurate temperature control within plus or minus 5° F, and easy and safe operation by any foundry employee from the remote control panel. Leakproof, modular independent units permit more accurate control, and eliminate the possibility of downtime. Take advantage of Brown's unequaled experience and specialization. Contact the Brown home office today.

For further information write for Foundry Cupola Survey Form

HEAT EXCHANGE SURFACE
BROWN THERMAL PRODUCTS

THE BROWN THERMAL PRODUCTS CORP.

Subsidiary of Brown Fintube Company

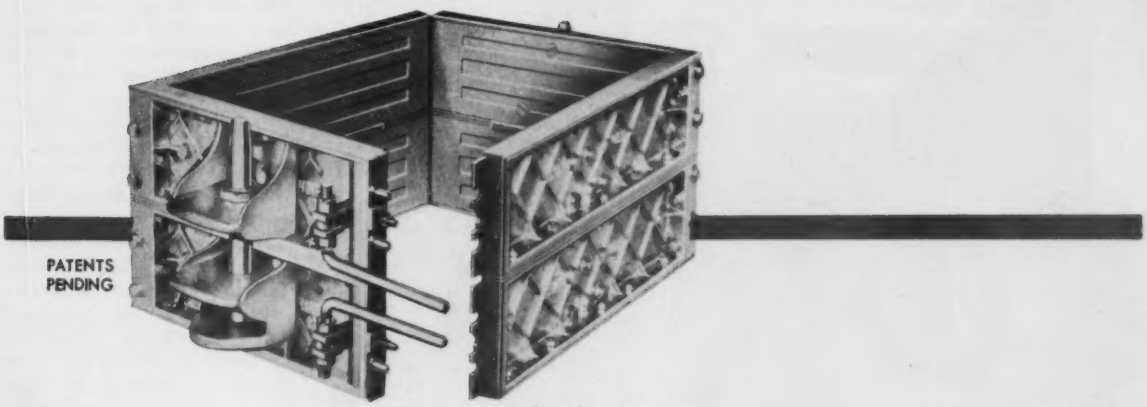
305 HURON STREET • ELYRIA, OHIO • Telephone: FAirfax 3-3291

SALES OFFICES AND REPRESENTATIVES: Chicago • Detroit • Houston • Los Angeles • New York • Oakland • Philadelphia • Pittsburgh

HINES straight-wall "HINGE-OFF" FLASKS

One of many **HINES** *developments contributing to better foundry production*

Lightweight metal flasks, recommended for hand and mechanical molding of loose match plate and cope and drag plate patterns, up to 20" in length.



PATENTS PENDING

- Made of metal, the "HINGE-OFF" maintains alignment — will not warp from absorbing moisture.
- Positive, fast-acting locking mechanism aligns and locks the open end rigidly, to prevent shift.
- Only one adjustment — tightening the nuts on the locking mechanism. Low maintenance cost — flasks can be repaired and aligned in your own plant.
- No wood screws to work loose!
- Accurate pins and guides, and pin center alignment.
- Lengths and widths, 10" to 20". Depths from 6" to 11". Standard HINES pins, bushings or guides. Upsets and bands can be supplied.

WRITE FOR CATALOG FOLDER NO. 201

THE HINES FLASK CO.
3431 WEST 140th STREET • CLEVELAND 11, OHIO

HINES FLASKS

Circle 605 on Page 53

1 remote roof cylinder mounting

Electrode superstructure integral with tilting portion of furnace, eliminates any possibility of misalignment of electrode columns from shell or roof distortion. Rugged time proven cylinder for plowing through toughest scrap. No damage to cylinder from hot metal splashes, scrap or runouts. Roof opens completely with minimum rotation—no cross-over and fouling to secondary flexible cables. Improved lift stroke facilitates swinging roof over pyramided scrap. Low center of gravity to furnace. Improved wheelbase and better protection for mast guidance. Shorter, more rigid electrode arms.

5 mechanical tilting

Eliminates the foundation expense, fire hazard, mess, and maintenance of hydraulic cylinder tilting. Provides variable speeds of tilt to 1° per second. Safe, dependable, time-proved —engineered to be out of danger of damage by hot slag, runouts, etc. Minimum maintenance, maximum accessibility. Fail-safe design permits emergency manual tilting from safety of operating floor.

ENGINEERING SERVICE Swindell-Dressler

Corporation provides a complete engineering service for the metals industry in the design and construction of new plants, and modernization of existing facilities. Consultations arranged gladly on request.

The features that make perfection
IN ELECTRIC ARC MELTING PERFORMANCE

2 flush door mechanism

Permits rapid charging through fast, accurate placement and removal of charging bucket without maneuvering. Prevents damage by charging bucket or magnet to door guides, hoist mechanism and drives. Door cheeks and guides are designed to permit greater access to all of hearth area for maintenance.

3 3 point roof suspension

Distributes roof load equally to water-cooled roof suspension beams—prevents roof ring distortion in lifting—permits roof to "float," safeguarding electrode alignment if shell sidewalls expand, yet is rigid in horizontal plane to guard against damage if swinging roof collides with pyramiding scrap. Oversize diameter roof ring of exclusive I-beam design.

4 expendable shell panel construction

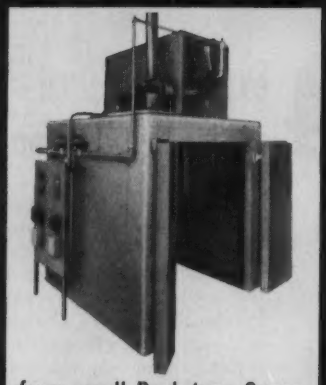
Localizes any shell damage—safeguards balance of furnace and its alignment. Panels can be easily replaced without disturbing refractory sidewalls. Panels can "breathe" for expansion and contraction. Water-cooled annular ring ties heavy buckstays at parting line.

SWINDELL
ELECTRIC ARC MELTING FURNACES

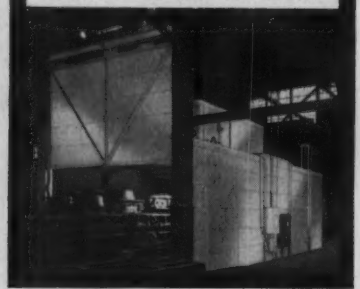
SWINDELL-DRESSLER CORPORATION
DESIGNERS AND BUILDERS OF MODERN INDUSTRIAL FURNACES
PITTSBURGH 30, PA.

Circle 606 on Page 53

LANLY heat processing equipment for the FOUNDRY INDUSTRY



from small Rack type Ovens to the BIG CAR TYPE OVENS



If a need arises to replace or improve your Foundry Ovens, it is only logical to look to LANLY, recognized authorities in the design and construction of heat processing equipment for more than 22 years.

TODAY may be the opportune time to survey your present facilities and request the counsel of a LANLY representative at no obligation.

THE Lanly CO.

FOUNDRY OVENS 2800 Euclid Avenue • Cleveland 15, Ohio

write for FREE bulletin

Find Your Representative in The Yellow Pages

Atlanta, Georgia Birmingham, Ala.
Boston, Mass. Chicago, Ill. Cleveland, Ohio
Columbus, Ohio Detroit, Mich.
Rochester, N. Y. Pittsburgh, Pa.
San Francisco, Calif St. Louis, Mo.

Circle 607 on Page 53

Readers' Comment

School Obtains Its Furnace

To The Editors:

As a result of the announcement in the April issue of Foundry that the Polytechnic Institute of Brooklyn would like to acquire a metal melting furnace, the International Nickel Co. Research Laboratory, Bayonne, N. J., donated an Ajax furnace that meets our needs.

In behalf of the Metropolitan Chapter, AFS, the Polytechnic Institute of Brooklyn, and myself, I thank you for giving our request the attention that brought results.

William H. Ruten
Professor of Mechanical Engineering
Polytechnic Institute of Brooklyn
333 *Jay St.*
Brooklyn 1, *N. Y.*

Would Increase Production

To The Editors:

While going over the Questions and Answers section of your September issue, I find a discussion as to whether to make a certain flat back ornamental aluminum casting in the cope or in the drag of the mold.

Have you considered the possibility of producing castings in both the cope and drag of the mold, using a flat back dry sand core to separate the two castings? This would be a simple core to make and would practically double the production of the molder.

John G. Steinebach
Assistant Plant Superintendent
The A. P. Smith Mfg. Co.
East Orange, N. J.

Editor's Note: This suggestion merits consideration. Whether the change will be advantageous requires careful study of all costs involved in each method of operation. Although dry sand work is more expensive than green sand, due to binder and baking costs, it seems doubtful that the higher core cost will nullify the advantage of producing two castings in place of one.

A Textbook for Students

To The Editors:

I know you are proud of your symposium on solidification in your September issue. Am concerned if you are proud enough.

To me this is a text on the college level on solidification. More important, it also is the only one.

Hope that some type of distribution to students is contemplated. However, this symposium should not be restricted to students interested only in foundry operations. It should be in the hands of all metallurgy students as a textbook.

Congratulations!

John B. Caine
Consultant
15 *Linden Drive*
Cincinnati 15, *Ohio*

Solidification Articles Useful

To The Editors:

Congratulations on a particularly worthwhile issue of your magazine. The articles contained in the September issue on equilibrium diagrams and their importance to and use by foundrymen are, I am sure, going to be of the greatest assistance to the whole industry.

Eugene Hervey
President
Winters Foundry & Machine Co.
Canton 5, *Ohio*

Anyone Know Its Origin?

To The Editor:

I have recently acquired the casting shown in the accompanying illustration. To me this represents the work of a true craftsman in both molding and patternmaking. The metal is some kind of white metal.

It bears the inscription "WAAGEN 1810." Can you please help me or tell me how to go about finding out something of the origin and background of this work of foundry art?

J. Clinton Pope
Vice President
Florida Pipe & Foundry Co.
P. O. Box 187
Haines City, Fla.

Circle 608 on Page 53→

Smooth as Satin

You can feel the difference

SAVINGS PYRAMID with KORGLAZE

DOES your work require a fine, smooth, "as-cast" surface? This impeller for a fire pump does—it must be cast clean, and United has found a sure road to perfection with KORGLAZE.

KORGLAZE is a vehicle for use with talc or graphite in coating cores and molds. It will prevent metal penetration and protect a fine line of cleavage between sand and casting. KORGLAZE will air dry leaving the refractory firmly bonded to whatever surface it is applied and the end result in your castings can be amazing.

We chose an impeller for this ad because the very efficiency of a fire pump may depend on this single casting and unless the vanes can be cast with a clean smooth surface there is no way to deal with roughness.

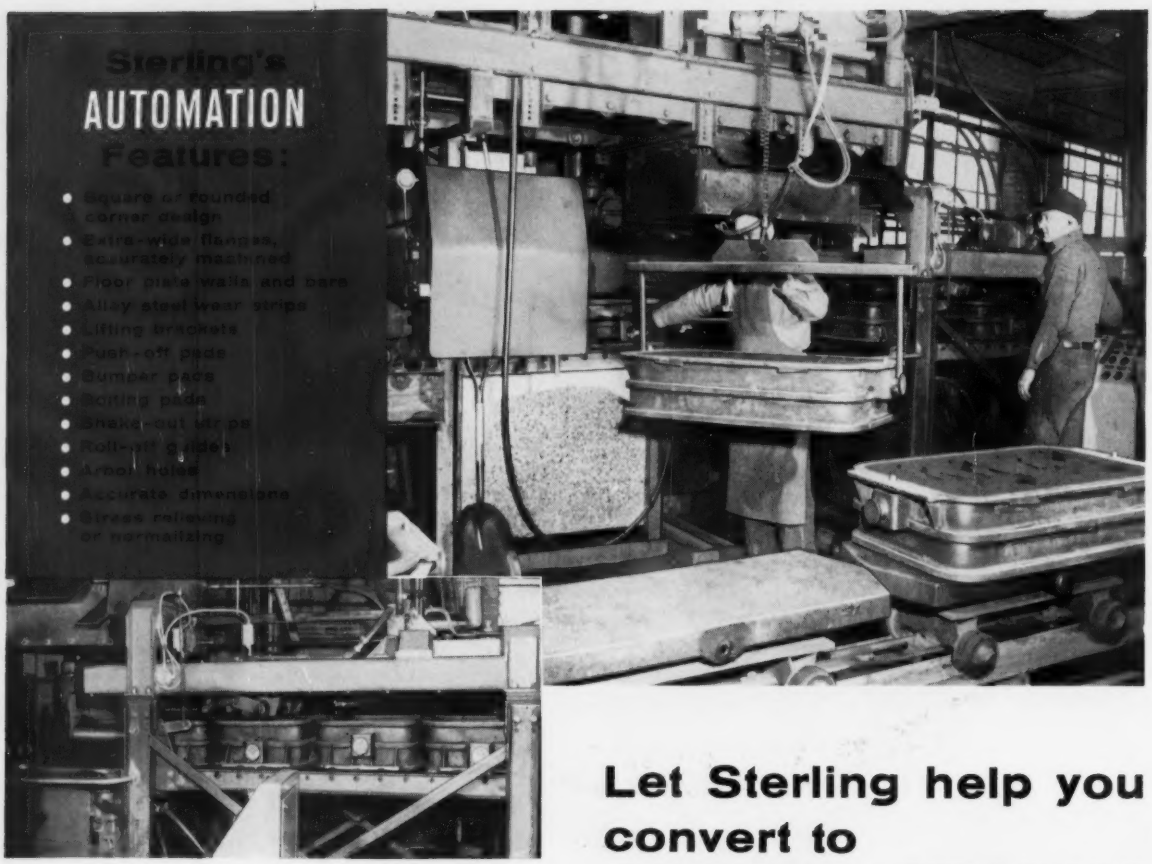
KORGLAZE will show equal value for all types of metal, and when used on shell cores or molds it preserves the silvery sheen of aluminum and magnesium.

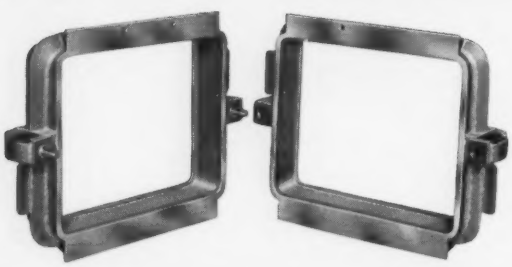
Specially designed lamp used to examine inner "as-cast" surfaces of the above impeller casting at Hale Fire Pump Co.

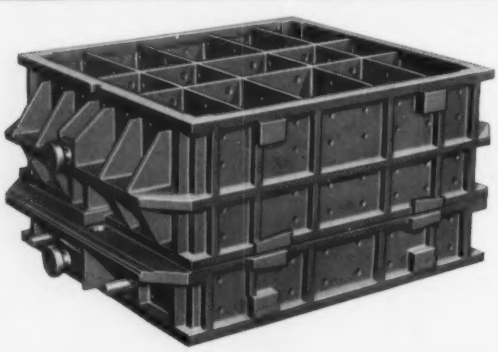
Our KORGLAZE folder tells all about this fine work. Write us for your copy.

UNITED OIL MFG. COMPANY

1429 WALNUT STREET, ERIE, PA.







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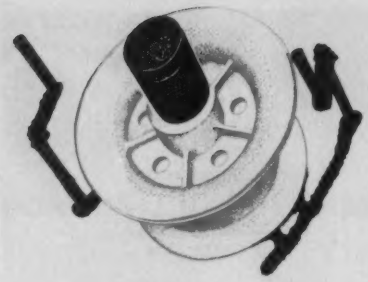
Frank G. Steinbach

Editor



Shrinkage defects depend on the mechanism of solidification, thermal conditions, and size and location of risers. Here consideration is given to general risering requirements to avoid these defects in castings ● ● ●

Risering of Castings

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● THE selection and use of risers to insure the absence of shrinkage defects in castings has been one of the more active and beneficial fields of research in cast metals during the last twenty years. The problem has been approached by numerous investigators from heat flow and metal solidification considerations.

The result has been the development of satisfactory risering techniques for many cast metals. While all factors have not been established quantitatively for all metals, the remaining gaps are being filled rapidly. It appears that shortly foundrymen can look forward to a time when a few relatively simple computations will permit the placing of acceptable risers on all types of castings.

Calculation of risers was first presented quantitatively by Chvorinov.[1] This subject has been discussed in considerably more detail in several recent articles. Caine[2] and Merchant[3] review the basic variables and provide a fundamental approach for selecting adequate size risers for all types of cast metals. Adams and Taylor[4,5] also have treated numerous aspects of the problem from a heat flow and solidification standpoint.

These authors describe quantitative procedures for assessing the influence of numerous variables and computing riser dimensions. Other papers have been concerned with the proper risering of such metals as steel,[6-11] gray iron,[12-17] ductile iron,[18-21] aluminum,[22-24] and copper-base alloys.[25-27] These investigations describe both the relative dimensions of the casting and the riser that are necessary for soundness and the requirements of riser position to maintain directional solidification. The importance of thermal gradients in assuring directional solidification has been recognized and quantitative recommendations of these gradients are made for several metals.

This discussion is concerned with the general risering requirements to avoid shrinkage defects. Such defects can assume several widely differing forms including gross shrinkage cavities, worm holes, centerline or dispersed porosity, internal hot tears and sinks—all attributable to improper risering. The type of shrinkage defect depends on thermal conditions under which the casting solidifies, the mechanism of solidification of the metal and the size and location of risers. The types of shrinkage encountered and means of avoiding these difficulties will be discussed for each specific metal in subsequent articles by other authors.

REQUIREMENTS OF A RISER

Adequacy—To be adequate a riser must 1) have sufficient volume to compensate for liquid and solidification contraction and any mold cavity enlargement which occurs, and

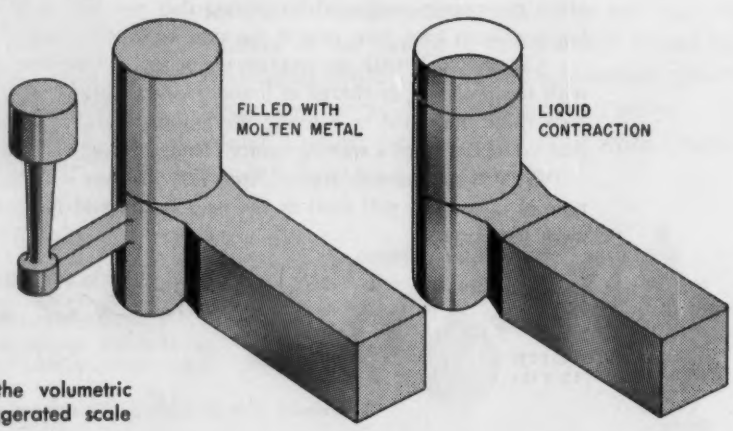


Fig. 1—Schematic presentation of the volumetric requirements of a riser on an exaggerated scale

2) remain liquid longer than the casting. The volumetric requirements of a riser are shown on an exaggerated scale in Fig. 1.

1. **Liquid Contraction** — The amount of liquid contraction depends on the superheat (the temperature difference between the pouring temperature and liquidus temperature) of the metal when poured into the mold cavity. The greater this superheat, the larger the amount of liquid contraction. While the contraction per degree of superheat varies somewhat for different alloys, 1 per cent contraction per 200° F superheat can be considered as an average value.

Liquid contraction occurs very rapidly after a casting has been poured, and frequently much of the feed metal for this contraction is available from the gating system. Thermal studies of castings have shown that the entire cross section reaches the liquidus temperature before appreciable solidification occurs. Accordingly, large allowances for liquid contraction may not be required in many cases.

2. **Solidification Contraction** — The amount of solidification contraction varies widely for the common foundry alloys, as shown in Table I.

The primary function of risers is to provide a source of liquid metal that will be available to flow into the solidifying casting to compensate for this contraction. Size of the risers employed, however, is usually affected only slightly by the amount of solidification contraction which occurs. Reason for this is that the riser must remain liquid longer than the casting in order to serve as this source of feed metal. This latter fact requires the use of risers —when molded in a similar material as the casting—that far exceed the volume of this contraction.

To compensate for this solidification contraction, the riser must be able to supply molten metal to all parts of the casting which require feed metal as they solidify. Location of the riser and mode of solidification of the metal must be such that the riser has this capability. This last subject is a very important consideration and will be discussed in detail in a subsequent section.

3. **Mold Wall Movement** — The prevention of shrinkage defects requires that the riser be able to provide metal to compensate for any expansion which occurs in the mold cavity. Such expansion is a problem in the feeding of gray and ductile iron castings produced in green sand.[15,16,28] Some mold cavity enlargement also takes place with a few nonferrous alloys.

TABLE I — Solidification Contraction for Various Cast Metals

Metal	Per Cent Volumetric Solidification Contraction
Carbon steel	2.5 to 3%
1% Carbon steel	4
White iron	4 to 5.5
Gray iron	Expansion to 2.5
Copper	4.9
70% Cu—30% Zn	5.5
90% Cu—10% Al	4
Aluminum	6.6
Al—4.5% Cu	6.3
Al—12% Si	3.8
Magnesium	4.2
Zinc	6.5

Providing feed metal to compensate for all of this expansion is difficult because 1) the majority of the expansion happens during the latter stages of solidification, and 2) mold cavity enlargement occurs primarily with alloys that solidify in a mushy manner, thereby interfering with the movement of feed metal. The problem can be reduced by hard ramming, low moisture, and seacoal additions in green sand and virtually eliminated by dry, core, or CO_2-set sand molds.

Some limited evidence[15] exists that sand wall movement can reduce the volume of the mold cavity and reduce risering requirements for alloys solidifying in a mushy manner. When rigid, dry sand molds are heated appreciably, such as in the larger, chunky castings, the sand expansion occurs inward. Sand cores also can expand appreciably in the larger castings and reduce the volume of the mold cavity, thus providing a self-feeding effect on the casting.

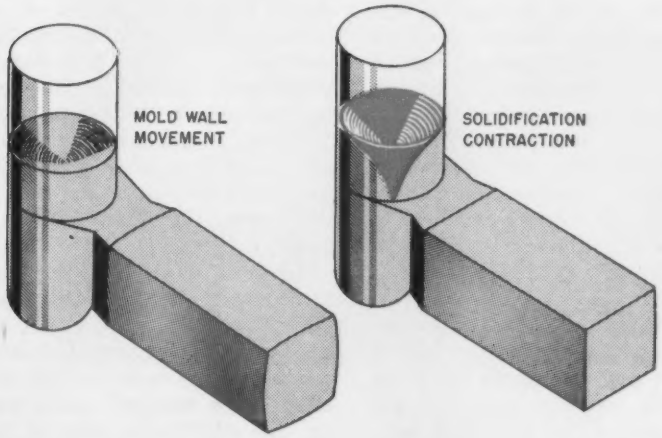
Metals that solidify with a solid skin formation, however, are not appreciably affected by changes in mold cavity dimensions because the rapidly solidified skin can contain the remaining molten metal if the cavity enlarges or restrain any tendency for the inward movement by the mold or core.

4. **Thermal Considerations**—

(*a*) *Riser Shape*—Calculation of adequate risers to feed castings has been based primarily on the requirement that the riser must remain liquid longer than the casting to serve as a source of feed metal for the entire casting.

The original work of Chvorinov[1] stated that the time a solidifying casting remained molten is proportional to the square of its volume divided by the square of its surface area. Since it is desired that the riser will be as efficient as possible to maintain a high casting yield, the riser should have the minimum surface area for a given volume. This shape condition is best fulfilled by a sphere, but such a shape is awkward to affix to a casting. Therefore, cylinders generally are employed for risers since they are a convenient shape with a reasonably low SA/V ratio. To maintain a low SA/V ratio, hemispherical shapes are recommended for the bottom of side risers and top and bottoms of blind risers.

Lower surface areas for a given volume are obtained with a ratio of height to diameter of the cylindrical riser of from 0.5 to 1. From a practical standpoint, the ratio of height to diameter of 1 to 1 has been found to be most convenient



and is generally employed. It is necessary to insulate the top surface of the riser under these conditions and to be assured that the top surface of the riser is somewhat above the casting throughout the solidification period.

(*b*) *Calculation of Riser Diameter* —Based on Chvorinov's work, Caine[2,6] proposed this general formula for the minimum size of effective risers:

$$x = a/(y - b) + c, \text{ where}$$

$$x = \frac{\dfrac{\text{Surface Area of Casting } (SA_C)}{\text{Volume of Casting } (V_C)}}{\dfrac{\text{Surface Area of Riser } (SA_R)}{\text{Volume of Riser } (V_R)}}$$

$y = V_R/V_C$. b = fractional solidification shrinkage. c = factor comparing heat transfer of media surrounding riser and casting; unity for similar molding materials. a = adjustable constant.

The computation of riser sizes by Caine's formula is a rather involved procedure requiring several trial computations, however, and some simplifications and adjustments have been presented. The work performed at the Naval Research Laboratory developed a procedure that permitted the rapid determination of riser sizes based on a plot of (L + W)/T (length plus width of casting divided by its thickness) versus V_R/V_C.

This type of plot is shown for medium-carbon steel castings in Fig. 2. It contains the experimental data of NRL and the computed points by Caine's method. The NRL procedure permits a rapid determination of the V_R/V_C ratio, and when the riser volume is computed by multiplying the known casting volume by this ratio, the riser dimensions can be readily determined from Fig. 3.

The plots of (L + W)/T versus V_R/V_C can be converted to straight lines on log - log plots[29] to simplify the establishment of these minimum riser sizes for various alloys, as illustrated in Fig. 4. In addition to facilitating the computation of riser sizes, the NRL data are based upon empirical rather than theoretical work, thus affording less opportunity for inaccuracies.

The (L + W)/T procedure, however, has the disadvantage of less accuracy than calculations based on the surface areas and volumes of casting and riser, since the relative solidification times are primarily determined by these values. The use of the NRL procedure also requires considerable experimental work with each alloy in order to obtain sufficient established points for minimum riser sizes.

A recent article[30] presents some general empirical equations that are applicable to all foundry metals (except gray and ductile iron) and offers the possibility of simple, rapid calculation of riser sizes while making an allowance for the shape factor. These equations are:

$D = 2.5T + .02V_C/T^2$ for plate shaped castings.

$D = 1.25T + .08V_C/T^2$ for bar shaped castings.

$D = .83T + .18V_C/T^2$ for chunky castings.

where D = diameter of riser (height = diameter), top insulation only. T = predominant thickness of casting section.

In general, the expression which gives the smallest diameter of riser is most correct for shapes which do not fall cleanly into one of the three categories.

The best accuracy in computing riser sizes is, however, only possible when the liquid and solidification contraction are considered along with the exact surface area and volume ratios of riser and casting. This approach to the problem was made by Merchant[3] in a recent paper. The equation for riser size calculation reported after simplification to allow for only one riser and a riser height equal to diameter is:

$125/SA_C = D/bV_C - 1.275/D^2$

where b is the fractional liquid and solidification contraction.

The solution of this equation for a riser is, unfortunately, fairly involved. To facilitate its use, it is necessary to establish plots of the diameter of riser required for various combinations of casting volumes and surface areas. A plot of the data given by this equation for plain carbon and low alloy steel is demonstrated in Fig. 5. When the liquid and solid contractions are known, these plots can be drawn fairly rapidly for any metal with the aid of computing equipment.

(c) *Use of Riser Necks*—A complete consideration of riser sizes also should include the method of attaching the riser to the casting. The ideal riser neck should be so dimensioned that it solidifies after the casting but slightly before the riser. With this arrangement, the shrinkage cavity is entirely within the riser, since this is the last part of the casting-riser combination to solidify.

The cross section of the riser neck is dependent on its length; generally, the shorter the length, the smaller the cross section. This latter condition exists because of the heat effect of the riser and casting mass on the solidification rate of this

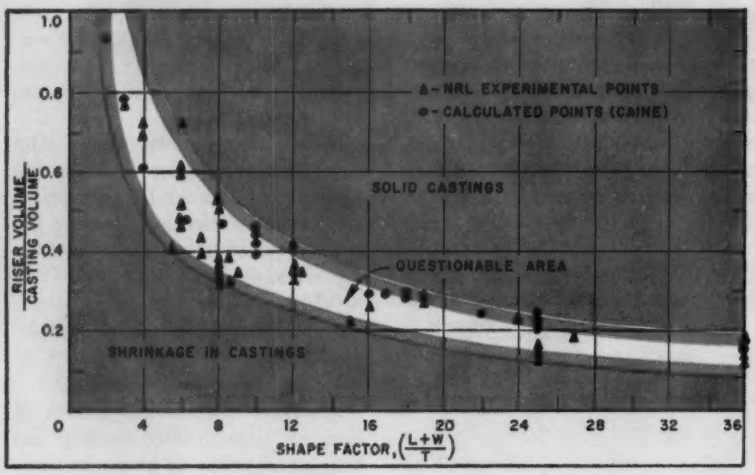


Fig. 2—Relation of casting shape factor to minimum effective riser volume as a fraction of casting volume for medium carbon steel

TABLE II—Riser Neck Dimensions

Type Riser	Length, L_N	Cross Section
General side	Short as feasible, not over $\frac{D}{2}$	Round, $D_N=1.2L_N+.1D$
Plate side	Short as feasible, not over $\frac{D}{3}$	Rectangular, $H_N=.6$ to $.8T$ as neck length increases $W_N=2.5\ L_N+.18D$
Top	Short as feasible, not over $\frac{D}{2}$	Round, $D_N=L_N+.2D$

L_N, D_N, H_N, W_N=length, diameter, height and width of riser neck, respectively. D=diameter of riser. T=thickness of plate casting

neck. The foundry industry frequently employs thin, strong ceramic or core material, called Washburn cores, to reduce the cross section of the neck and facilitate riser removal. The shape of the neck also is influenced by the dimensions of the casting.

Specific recommendations on the dimensions of riser necks are contained in the literature.[15,31] Dimensions for the riser necks suggested by these publications are shown in Table II for side and top risers for general and plate type castings. Riser necks should be round where possible. Molding conditions and dimensions of the casting and riser limit the shortness of the neck, but shorter and thinner necks are preferred when feasible. Riser necks attached to plate castings should have a smaller thickness than the casting.

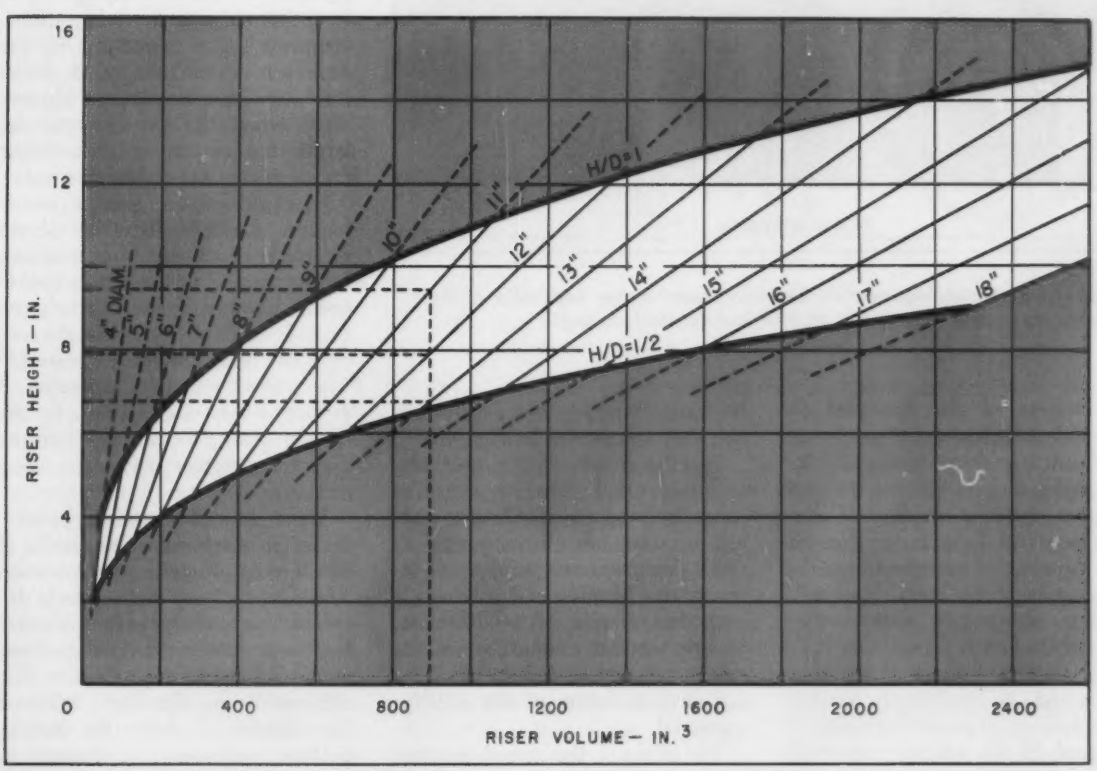
Positioning and Number of Risers—In addition to remaining liquid longer than the casting and containing sufficient volume, risers must be so situated and the casting so designed that liquid metal can flow to each part of the casting as solidification proceeds. To attain this goal, the risers must be located properly and a sufficient number employed.

Selection of riser number and location is determined by the design of casting, presence of chills and, to a considerable extent, by the manner in which the casting solidifies. The range over which a single riser will provide feed metal to a straight-sectioned or tapered casting is known as the feeding distance of that riser.

Considerable work on the feeding distance of adequate risers for medium carbon steel castings has been reported by NRL. These investigations have established the feeding distance for steel of risers on plates,[7] bars,[8] and on simple joined sections,[9] including the effect of chills on this feeding distance.

The feeding distance of a single riser in steel can be greatly lengthened by gradually increasing the thickness of the sections towards the riser. A taper of .5/T in. per foot, where T is the thickness of a cast steel plate in inches, is sufficient

Fig. 3—Chart for conversion of riser volume to riser dimensions[10]



to insure soundness from a top riser. The influence of taper on feeding distance of steel has been investigated and reported in detail.[32]

Tapering the cast sections to improve feeding distance is not as effective for the alloys with higher thermal conductivity, such as copper and aluminum base metals. Use of chills and insulated risers has proved to be a more effective means of increasing feeding distance on these latter alloys.

Ability of a riser to feed various sections of a casting depends on the proper control of the solidification pattern, so that sections remote from the riser solidify first and solidification proceeds towards the riser.

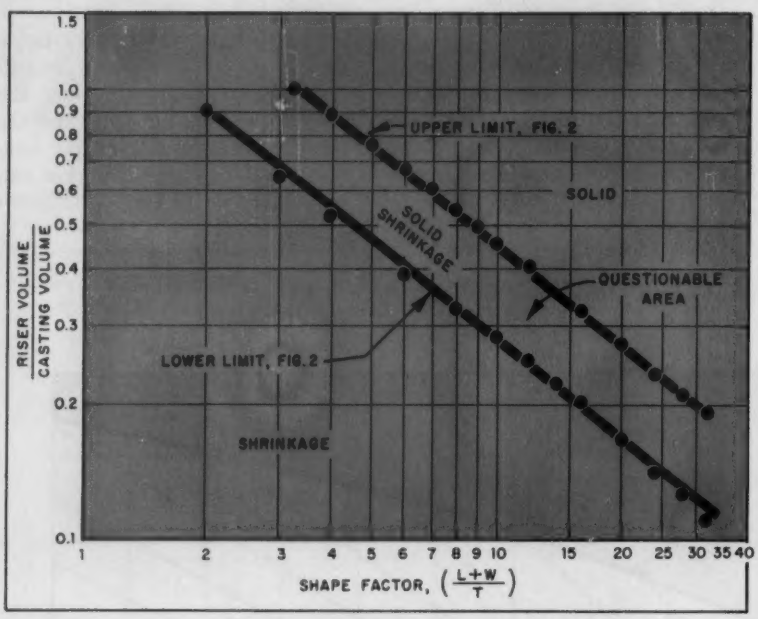


Fig. 4—Plot of log-log relation between shape factor and ratio of riser volume to casting volume for medium carbon steel castings[29]

Maintenance of this controlled directional solidification depends on the thermal gradients in the solidifying casting and on keeping the feed channels open for the flow of metal. These two facts are influenced by a number of considerations; the influence of chills, molding material, and tapering is shown schematically in Fig. 6.

The feeding distance of the riser in Fig. 6A is insufficient, so that centerline or dispersed porosity is produced in the central portion of the casting. The thermal gradients necessary for soundness were obtained only in the end portions of the casting and near the riser. Adding a chill on the end of the cast section remote from the riser, as shown in Fig. 6B, increases the length of the sound portion at this end to some extent but in this case is insufficient to remove the shrinkage over the entire length.

It is possible, however, to further improve this thermal gradient and obtain complete soundness by tapered external chills, as illustrated in Fig. 6C, or by a combination of an external end chill and molding materials of higher thermal conductivity (Fig. 6D). The section also can be made sound by tapering towards the riser as shown in Fig. 6E.

Feeding distance of a riser also is influenced by the properties of the solidifying metal. Greater feeding distances are obtained with 1) small temperature difference between the liquidus and solidus, 2) high temperature of solidification, 3) low thermal conductivity of the cast metal, and 4) low specific heat and heat of fusion of the solidifying metal.

The effect of the spread between the liquidus and solidus temperature of metals which solidify as solid solutions is particularly important on the feeding distance. If these alloys exhibit a large spread between these temperatures, as shown schematically in Fig. 7A, the mushy type of solidification that results impedes the flow of feed metal and produces a short feeding distance from the riser. When only a small temperature difference exists between the liquidus and solidus, as illustrated in Fig. 7B for the same thermal gradient, the smoother wall of the advancing solidification does not interfere as much with the flow of feed metal and longer feeding distances prevail.

The difference between the liquidus and solidus temperatures explains the long feeding distance of pure metals and commercial copper-zinc and copper-aluminum alloys compared with the short feeding distance of the mushy-solidifying copper-tin and aluminum-magnesium alloys. Chills and insulated risers are necessary to obtain appreciable feeding distances in the latter metals.[23,26,27]

The feeding distance of eutectics presents a special case. These metals freeze at a single temperature but frequently exhibit a mushy solidification pattern. It appears, at least for the commercial graphite-austenite[17] and aluminum-12 per cent silicon eutectics, that better fluid transport or feeding distance exists when the eutectic cells are larger and maximum undercooling occurs during the solidification.

Large or complex castings usually require multiple risers to obtain complete soundness. The procedure for positioning and selecting the required number of risers for a given casting based on feeding distance data has been presented for steel.[10] The general principles apply for all metals. Risers are applied to the heavier casting sections and feed the appendage lighter parts from these locations.

When multiple risers are required, chills are employed at the limits of the feeding distance of each riser. The use of these chills greatly increases the feeding distance of risers because it adds the thermal gradient obtained from an edge effect to that obtained from the riser. Without the addition of chills, the feeding distance necessarily is limited to

the thermal effect of the riser.

Special Considerations—The calculations of riser sizes that were described under "Thermal Considerations" were based on the assumption that the casting and riser were surrounded by a mold of the same thermal characteristics and insulated on the top surface. The use of insulated sleeves surrounding the riser or sleeves and topping additions of exothermic materials can greatly influence the required riser sizes.

The riser diameters and volumes necessary for sound castings have been reduced and the effectiveness of feeding improved for both bronze[33] and aluminum-base[23,34] castings by the use of insulated sleeves. The extent of the reduction in riser size depends on the insulating properties of the sleeve material. The solidification time of the insulated material is extended, compared to the behavior of the riser in sand, according to heat flow calculations by the following ratio:[5] $K_S C_S C_{PS} \div K_I C_I C_{PI}$ where K_S, K_I = thermal conductivity of sand and insulator respectively. C_S, C_I = density of sand and insulator. C_{PS}, C_{PI} = specific heat of sand and insulator.

Since one of the requirements of the riser is to remain liquid longer than the casting, a corresponding direct reduction in riser size is possible. It is also feasible to employ insulating risers on iron and steel castings to reduce riser sizes if a sufficiently good insulator with the required refractoriness is developed.

Even further reductions in adequate riser sizes can be accomplished by means of exothermic sleeves or topping compounds. Two types of exothermics have proven to be most adaptable for use in foundries. For sleeves and topping, a compound composed of oxidizable metals which burn in air and in the presence of oxidizing compounds but do not produce metal; for topping, a metal-producing type making use of the thermit reaction.

The compositions of these exothermic mixtures can be controlled by various additions and mixtures to obtain rapid or slow reactions with a large or mild heat output. The use of exothermic riser sleeves on steel castings[35] permits a reduction in the diameter of an uninsulated riser by as much as 50 per cent. The exact volumetric reduction of the riser will depend on the casting shape, type and thickness of exothermic sleeve. Exothermic hot topping additions can accomplish a 30 to 70 per cent reduction in the height and, therefore, the volume of the riser employed on ferrous and nonferrous castings.

Since these materials tend to increase the temperature of the riser metal, they usually improve feeding slightly compared with conventional risering practice. Exothermic riser sleeves may be employed successfully on ferrous and copper-base metals but are not recommended for aluminum castings because the metal immediately under the riser is damaged by the slow rate of solidification.

Some special considerations apply to the use of insulated sleeves and exothermic sleeves and topping compounds. When sleeves of this type are employed, it becomes imperative to add an insulator or exothermic topping compound immediately after pouring the casting to prevent excessive heat loss from the top and a serious loss of riser efficiency.

The preferred ratio of height to diameter of the risers employing these sleeves may be somewhat greater than 1 to 1 in some cases to avoid loss of heat due to conductivity to the solidifying casting. The addition of the highly exothermic hot topping compound should be made during the last stages of solidification of the riser to obtain the maximum benefit from the heat evolved.

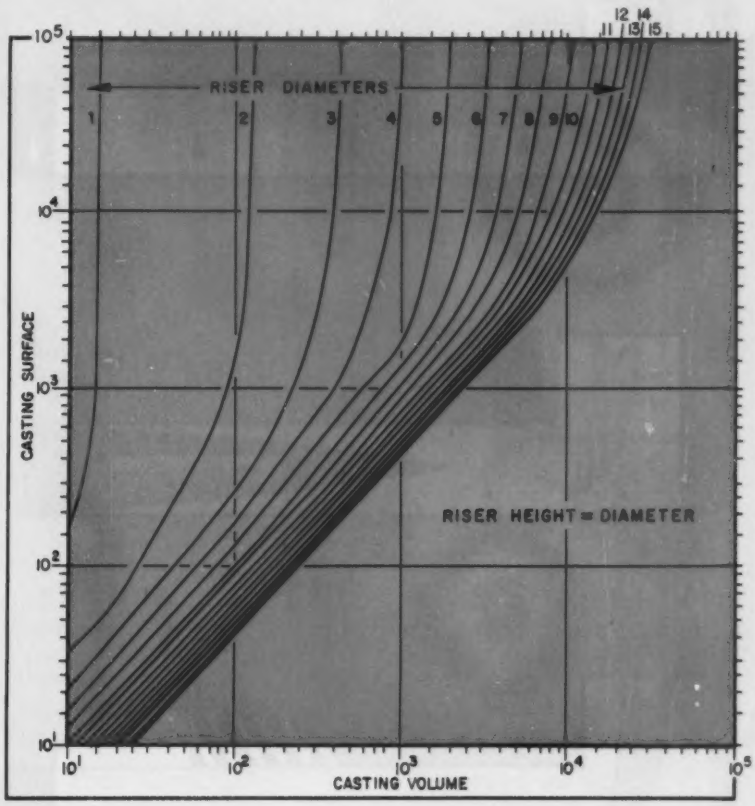
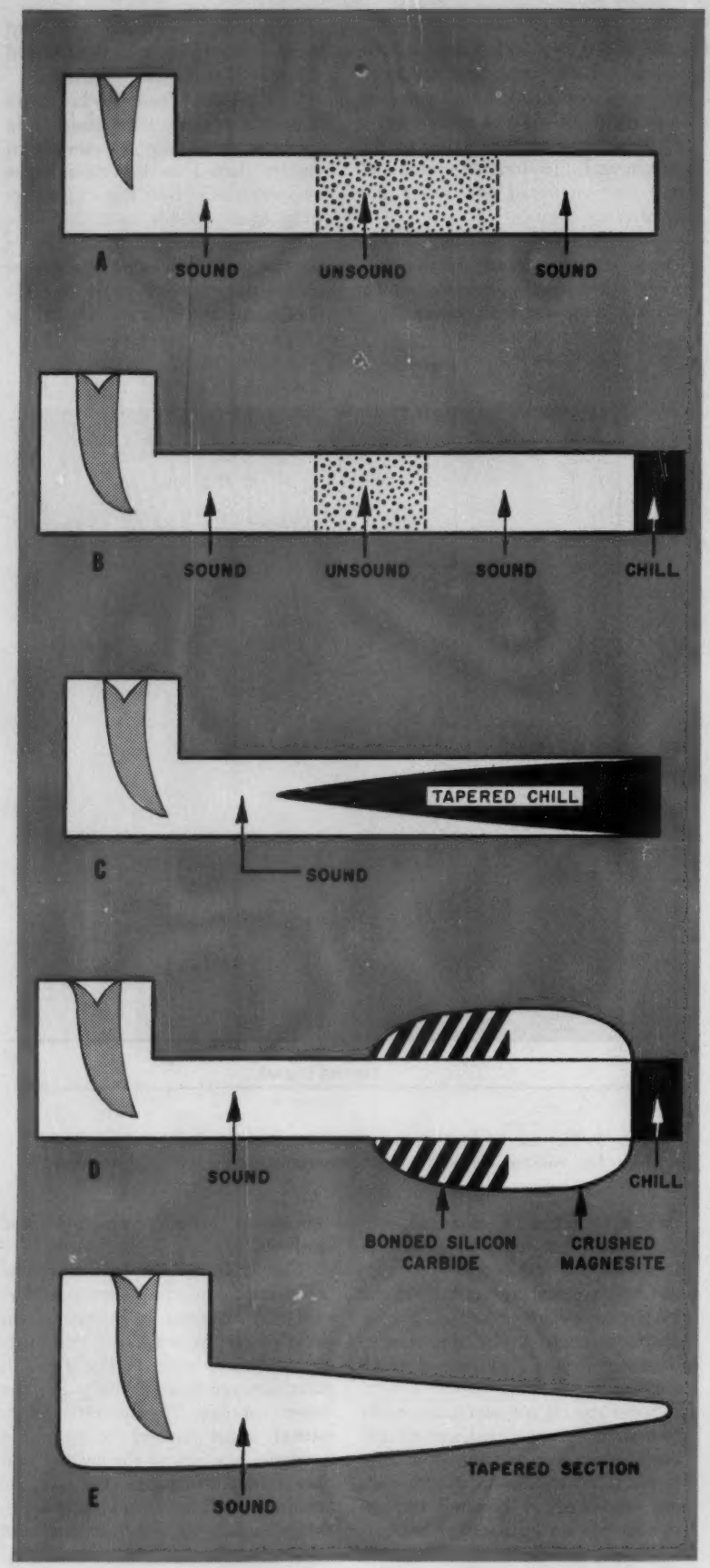


Fig. 5—Plot of riser diameters required for soundness in steel castings for various combinations of casting volumes and surface areas[3]

Gating Into Risers—Effectiveness of risers can be increased considerably by utilizing a gating system that enters the mold cavity through the riser as shown in Fig. 1. With this arrangement of the gates, the riser contains the hottest molten metal when pouring is completed and the portions of the casting that are remote from the riser are the coldest. Thus, a given riser will remain liquid for a longer time and desirable thermal gradients for im-



provement of feeding distance are established.

Side risers may be gated into readily, but top risers in the central portion of castings may offer more of a problem. In the latter case, the ingates should be placed so that as much as possible of the last metal entering the mold cavity remains in the riser. Gating systems also may be used as risers, particularly for small castings, investment castings, and metals with little apparent solidification contraction.

The location and type of ingates entering the mold cavity exert considerable influence on the prevailing thermal gradients. Multiple ingates, low-pouring temperatures, and rapid pouring rates produce a uniform temperature distribution; single ingates, high pouring temperature and slower pouring rates cause a considerable thermal gradient with a maximum temperature near the ingate.

When the casting is gated through a thin section, this portion of the casting will usually behave thermally as a much heavier section. The influence of ingate location is usually more marked in smaller size castings; the longer times of solidification and larger quantities of heat of the larger castings tend to eliminate thermal differences.

Risering of Gray and Ductile Iron—The austenite-graphite eutectic that solidifies in gray and ductile irons usually exhibits a solidification expansion. Hypoeutectic irons, then, can solidify with an over-all contraction, expansion, or no net change in volume, depending on the relative amounts of primary austenite and eutectic. For many commercial gray irons, risers are not required to compensate for solidification contraction since none occurs.

When a strongly hypoeutectic iron does solidify with a net contraction, it is only necessary for the riser to compensate for the contraction accompanying the solidification

Fig. 6—Maintenance of controlled directional solidification depends on thermal gradients in the solidifying casting and on keeping the feed channels open. Drawings to the left show the influence of chills, molding material, and tapering on feeding

of the primary austenite. Since the solidification of this austenite occurs first, the risers employed do not have to remain liquid until the casting has completely solidified and can, therefore, be considerably smaller than those used for other metals.

When gray or ductile iron castings are produced in green sand molds, however, the risering requirements to prevent shrinkage are affected markedly by mold cavity expansion as described previously in the section on "Riser Adequacy." This mold cavity expansion can exceed 3 per cent of the casting volume and it occurs primarily during the eutectic or latter stages of solidification. If this expansion takes place, large risers that remain liquid longer than the casting are necessary to insure soundness. Feeding distance of these risers is impaired because of the liquid metal transport problems encountered during the latter stages of solidification.

Ductile iron, because of its extremely small eutectic cell size, is even more subject to mold cavity enlargement than gray iron. Risering requirements of gray and ductile iron, then, are very dependent on the rigidity of the mold at high temperatures.

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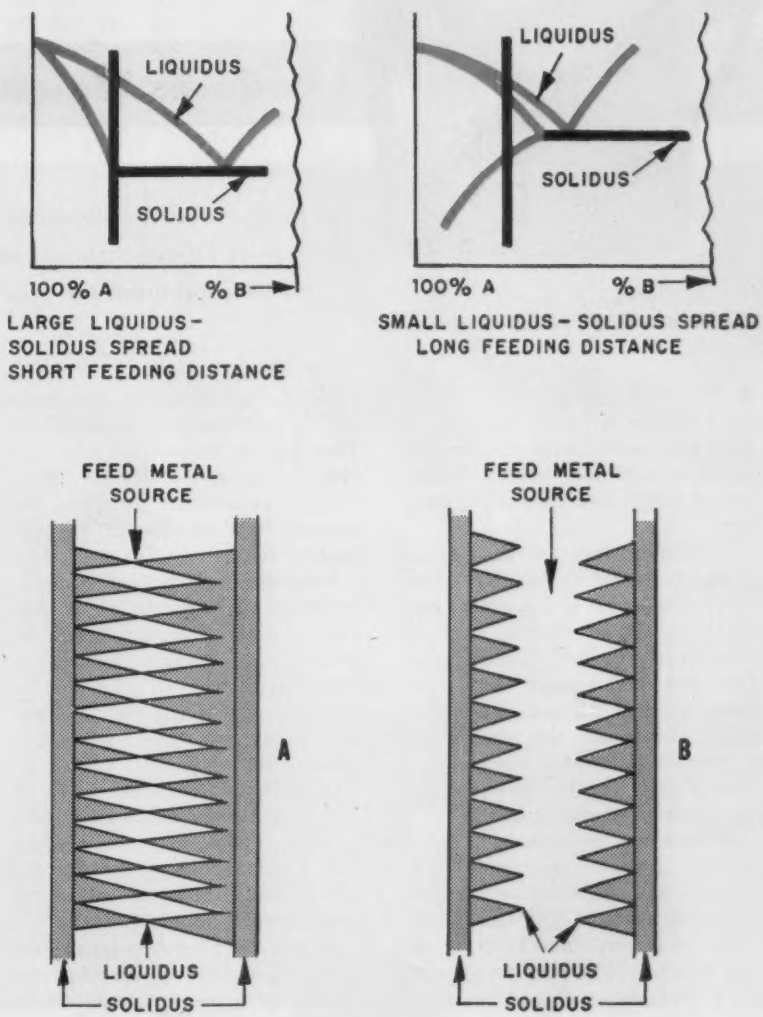
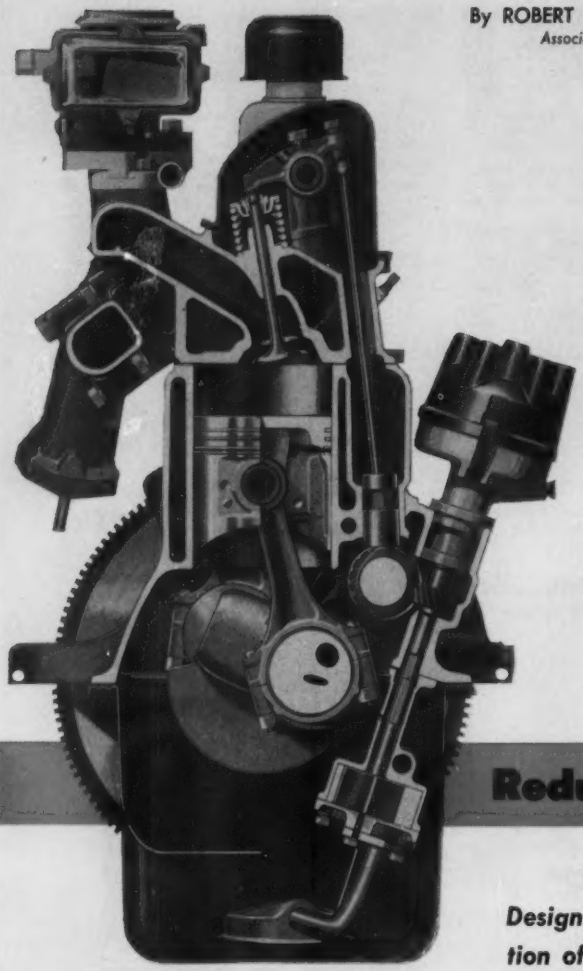
Fig. 7—Effect of a large spread between liquidus and solidus temperatures (A) and small spread (B). Same thermal gradient in castings



By ROBERT H. HERRMANN
Associate Editor

IMPROVED CASTING DESIGN

Reduces Weight of Falcon Engine



Cutaway view of the 90 hp, six cylinder Ford Falcon engine

Design and development work that went into creation of Falcon castings was part of an over-all engineering program for producing this new car

● ENGINE castings in Ford Motor Co.'s Falcon are good examples of how serviceable parts can be produced at minimum weight through proper design and careful engineering.

Development of the design and production techniques for these castings was part of a company program started in March, 1957, to develop an automobile offering comfort and performance about the same as then current models but lighter, smaller on the outside, and costing substantially less to buy and operate. The Falcon is the successful result of that program.

In essence, the successful development of this car resulted from extreme design simplification and precise engineering of every component. When engineers figured out on paper how much strength was needed in a part, they did not double or triple the specifications just to be sure of serviceability requirements. They had to be accurate and have faith in their calculations. Overdesign, unnecessary weight, and strength have no place in the competitive market.

Designing the Castings—Foundry engineers participating in development of engine components supplied designers with information regarding patterns and castings production requirements. Prototype patterns and castings were made, and all engineers concerned with engine development studied them to establish final designs that would result in parts capable of meeting torque and horsepower requirements and which could be cast easily and speedily in large quantities.

Engine machine shop people also participated in design development discussions to present requirements which would facilitate machining the castings. Locating and jigging points for machining were determined.

Castings involved are the engine block, weighing 112 lb before machining; a combined head and intake manifold, 65.1 lb; flywheel, 25.9 lb; exhaust manifold, 10.6 lb; bearing caps, 8.2 lb for a cluster of four; water pump housing, 3.3 lb, and a camshaft sprocket, 1.6 lb. They are of gray iron cast in green sand molds at the Ford Cleveland Foundry, Brook Park Village, Ohio. Weight was reduced considerably in these castings by reducing casting wall thickness an average of about 20 per cent from that used in the higher horsepower Ford six engine.

Other design features permit additional weight reduction, reduction in machining operations, and elimination of some assembly operations.

The combining of components, formerly cast separately, into single-piece castings has eliminated auxiliary parts such as bolts, gaskets, and covers. Over-all simplification of the engine has been achieved. In some instances, however, realization of these general advantages has required the production of more complex castings.

Engine Block—The Falcon block has no skirt below the main bearing line. A deep, pressed steel pan forms a major portion of the crankcase. This reduced weight considerably. On the other hand, the exterior wall of the push rod chamber is cast metal, eliminating a pressed steel cover, gasket, bolts, the drilling and threading of bolt holes, and the entire assembly operation.

Two blocks are cast in a mold. Nine cores are used in a mold as compared with seven cores for one block in the more conventional one-to-a-mold method. Falcon blocks are cast on the same line with the larger six and three versions of four-cylinder tractor engine blocks. Flasks for all jobs measure 30 x 35 in., with a 12-in.-deep drag and a 14-in.-deep cope.

Three barrel-crankcase cores, a middle and two outside units, are used in the mold. Since the outside barrel-crankcase cores are interchangeable, only two different cores need be produced. Each of the combination barrel-crankcase cores forms two cylinders and part of the crankcase in each of the two blocks produced in a mold. End cores, which fit against the two outside barrel-crankcase cores, form part of the timing chain housing on one block, the front portion of the flywheel housing on the other block, and the breather passage for the crankcase.

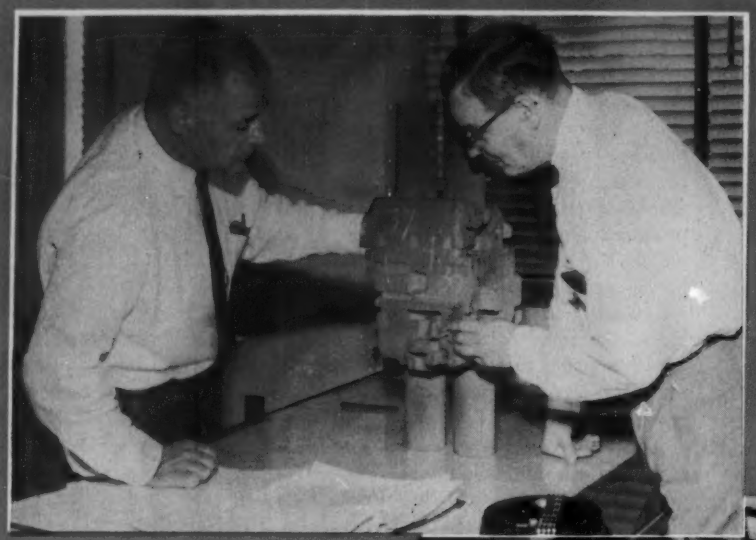
The barrel-crankcase cores are resin-bonded sand shell type. Ford engineers claim that the interchangeability feature is made possible because of the dimensional accuracy obtained in the shell cores. Resin-bonded sand also is used for the end cores. The cores are identical, but two are used in a mold. Conventional oil-bonded sand is used for water jacket and push rod chamber cores. Two of each are used in a mold.

Head and Intake Manifold—Combining the head and intake manifold into one casting eliminated separate pattern equipment, separate molding functions, the drilling and tapping of holes, machining of the mating surfaces, clamps, bolts, aligning sleeves, a gasket, and the whole assembly operation.

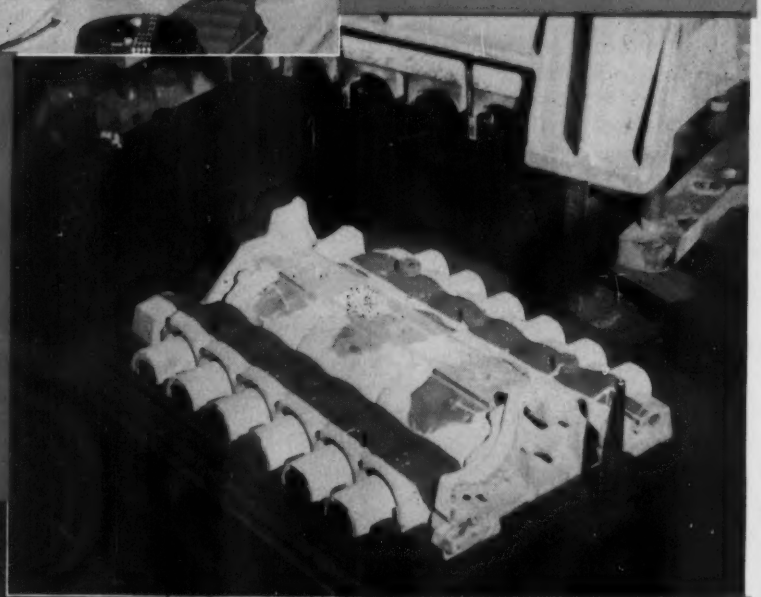
The weight also was reduced by eliminating flanges which would be required on the ports of separate heads and manifolds. The combined unit is a more closely coupled design because clearance is not needed for bolts and clamps used on separate pieces. This saves space in the engine compartment and simplifies maintenance.

The combined part requires right and left end exhaust port cores, a center core having four exhaust ports, a flange core forming the under side of the intake manifold, spark plug side core, intake pipe core with six intake ports, the lower jacket core, and upper jacket core.

E. E. Harkess, plant manager, Cleveland Ford Foundry, left, and H. R. Kalmbach, production manager, examine intake manifold core. Falcon castings made at the Cleveland foundry are grouped on table



Simon Lyss, manager, plant and manufacturing engineering, at left, and Alexander Lawrie, superintendent, cylinder block molding and core manufacturing, discuss problem on barrel-crankcase core



Assembly of cores making two blocks is shown in position in the drag half of the mold

Developing the Falcon engine took considerable engineering work as typified by this meeting of C. E. Goodman, manager of the Pattern Dept., left, and W. I. Finzer, superintendent, cylinder head and small parts molding and core manufacturing operations

All these are conventional oil-bonded cores assembled on a resin-bonded sand combustion chamber slab shell core. The head-intake manifold castings are poured two in a mold on one of the small parts lines.

Exhaust Manifold — One core blown with oil-bonded sand forms the interiors of two manifolds. Four castings are poured in a mold. No unusual coring and molding practices are employed for the flywheel, water pump housing, camshaft sprocket, and bearing cap castings.

Shell Core Making—Coated sand is prepared with powdered resin and alcohol in a standard muller, operating on an 11-minute cycle. Air at 300° F is blown through the muller to aid in evaporating the alcohol. A rounded grain AFS 75, washed and dried silica sand is used. Batches consist of 2750 lb sand, 75 lb resin, 12 qt alcohol, and 2 qt water.

Coated sand is discharged from the muller to a fast-moving cleated belt for elevation to a vibrating screen. Sand falls from the screen through gently moving air to a belt conveyor and to a bucket elevator which empties to an overhead distribution belt feeding hoppers over coreblowing machines. Barrel-crankcase cores are blown on semiautomatic roll-blow dump type machines. An electrically-heated, six-piece corebox is used. Box segments are opened and closed automatically.

Cores are carried by monorail conveyor to the finishing area where they are unloaded to a sliding belt conveyor for definning, patching, and inspection operations. Workers place individual cores in an air clamping fixture which seals the openings in the hollow cores. The clamping fixture is mounted on a spring balanced reel to facilitate easy handling of the core for dipping into a silica base wash and depositing it on a slat conveyor for movement through a horizontal oven. The drying cycle is 15 minutes at 400° F. Workers at the exit end of the oven rub off tear drops of wash and load the cores to a monorail conveyor for delivery to the foundry.

End cores for the block are produced on five-station turntable blow machines converted to the use of resin sand. The sand mix for these cores contains a little less resin than that used for the barrel-crankcase cores. Core finishing and coating operations are similar to those described previously.

The combustion chamber slab core is made on four-station blow machines. Coreboxes for this job have a hot half and a cold half. The core face against which the metal lies is produced by the hot half of the box. The contoured back of the core which fits against green sand in the drag is formed by the cold half. Running a cold half box permits mounting it permanently at the blowhole in the top part of the machine and using it as a common corebox segment with four hot lower halves. This reduces the investment in coreboxes. The permanent half box cannot be heated because problems would be encountered with curing of the resin-bonded sand in the blowhole, causing plugging.

A monorail conveyor moves combustion chamber slab cores to a slider belt conveyor. Oil sand cores used in the head-intake manifold assembly are delivered to the same conveyor. Workers along the slider belt paste the cores, using jigs and locaters for accuracy. Assemblies are checked in fixtures, then loaded to a vertical oven to dry for 1 hr at 225° F. A worker between the loading and return side of the conveyor flights unloads dried assemblies, dips them in a carbon-base wash, and loads them back on the same flight shelf. After their second trip through the oven they are unloaded to a monorail conveyor for delivery to the molding department.

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Jigs are used to check fit of assembled cores for head—intake manifold

Segregation is nearly impossible to control at the point of discharge from bottom dump equipment

SAND SEGREGATION

. . . CAUSES AND EFFECTS

Because sand segregation during handling can influence casting quality, an understanding of its cause and methods for correcting it can pay dividends

By T. W. SEATON
Sales Manager
American Silica Sand Co.
Ottawa, Ill.

● TECHNICAL PROGRESS in the foundry industry in this country has been greater in the years since World War II than at any previous time in history. During this period, various peculiar phenomena have been uncovered and explained. Others remain to be solved. In certain instances the discovery of these peculiarities has led to an understanding of problems which seem destined to be with us always.

One of these heretofore little understood problems has been the subject recently of much discussion and careful study. It is the problem of sand segregation.

Recent work conducted by Committee 8-F (Grading, Fineness and Distribution) of the AFS Sand Division has shed some light on this subject. Briefly summarized, the work of the committee covered two phases:

1. It showed how the use of multiple openings for discharging sand from storage silos would minimize the effect of segregation.

2. It made recommendations, based on the experience of producers and consumers, on how to minimize segregation when moving sand from one location to another.

This study has resulted in a substantial contribution to our knowledge and control of foundry sands.

Mechanism Is Simple—The mechanism of foundry sand segregation is simple. It involves a separation of the coarser particles from the fine particles during the movement of the sand. Although this separation is not limited entirely to dry, unbonded sands, these sands segregate to the greatest extent.

A pile of clean, dry silica sand has an angle of repose of about 32 degrees. It is thought of as looking like the pile in Fig. 1A. Upon closer examination, however, we discover that the coarser particles have rolled to the outside of this pile and the fine particles remain near the center (Fig. 1B). A reasonable explanation of this phenomenon would appear to be that the coarser particles roll away or segregate from the finer particles because of the movement of the sand mass.

This condition occurs every time dry, unbonded sands are moved, regardless of the quantity of sand being moved or the method of movement. It also occurs, but to a lesser extent, in damp and naturally bonded sands.

It is absolutely essential that both foundrymen and sand producers completely understand the mechanism of sand segregation and realize that it is always present in varying degrees—to a great extent in dry, unbonded sands; and to a lesser degree in damp, bonded sands.

While the sand segregation problem always has been with us, the trend toward use of more broadly distributed sands has led to a greater

awareness of the problem. The more broadly distributed sands show a greater tendency to segregate than do those of narrow distribution.

The extreme of a narrow distribution would be a sand concentrated on a single sieve or a sand made up of particles of a single size. Segregation does not occur here because the particles have nothing from which to segregate. As we spread the sand over more sieve sizes (broaden the distribution), segregation becomes quite pronounced. This does not mean, of course, that we should not use sands of broad distribution, but merely emphasizes that care should be taken in handling these sands.

What It Does—Let's take a look at what effect this sand segregation can have on our foundry sand practice and, of course, on the castings produced in these sands. First, let us consider the problem of laboratory checks on sand shipments and the effect this has where sand specifications are being considered or are actually in effect.

All of us have found at times that a sieve analysis made on a car of sand at destination does not agree with the analysis run at the point of production. In some cases it has resulted in the foundry's rejection of the car of sand, This is regrettable and always results in some misunderstandings. Freight rates being what they are today, it can also be very costly.

Much of the disagreement in tests can be traced to poor technique in handling and preparing samples for the test. Table I shows some data collected in our laboratory on a sample whose original size was 100 lb. The 100-lb sample was divided into twenty 5-lb samples. From each 5-lb sample a 50-gram sample was extracted by quartering and weighing out exactly 50 grams. A sieve test then was run on each 50-gram sample according to standard AFS procedure and the results of these tests are shown in Table I.

TABLE I—Segregation in Testing 20 Samples

U. S. Series Sieve Number	Average	Low	High
20	0.00	0.00	0.02
30	0.02	0.00	0.20
40	2.00	1.60	2.63
50	13.20	10.80	15.26
70	36.21	31.70	44.32
100	38.18	31.45	43.80
140	8.87	5.60	11.10
200	1.02	0.70	1.30
270	0.11	0.00	0.20
Pan	0.07	0.00	0.20

The analysis shown under the column headed "Average" is the average of the 20 tests. Under the columns headed "High" and "Low" are the actual highs and lows obtained from the 20 tests. In other words, these figures were the greatest deviations from the average reported on each of the sieves.

The deviation from the average on the U. S. Series sieve Nos. 70, 100, and 140 is in the range of 25 per cent of the amount retained on the sieve. This deviation, remember, has come about only during the preparation and testing of a sample amount of a larger shipment. Remember also that the samples were prepared by one technician and that the tests were all run by the same man. This procedure reduces possible sources of additional deviation since it is reasonable to assume that sampling and testing were done in a consistent manner.

It is also reasonable to assume that many foundrymen and sand producers are not aware that such tremendous deviations can occur. If we obtain deviations of this amount in samples taken from a 100-lb bag of sand, imagine the deviation possible when sampling a 50-ton car.

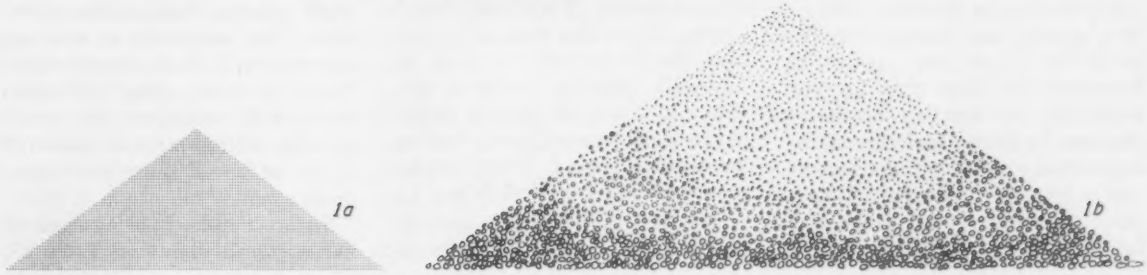
To determine what improvement could be made in the above results, another 100-lb bag of sand was selected, in this case a different grade from that used to collect the data for Table I. It was decided to obtain a sand of slightly broader distribution in order to exaggerate the segregation in handling, if possible.

Ten 10-lb samples were obtained by carefully quartering the 100-lb sample. The ten 10-lb samples then were reduced to approximately 50 grams by using a Tyler sample splitter. No attempt was made to ob-

TABLE II—Segregation in Testing 10 Samples

U. S. Series Sieve Number	Average	Low	High
20	2.12	1.96	2.31
30	7.78	7.13	8.33
40	7.49	6.94	7.96
50	18.41	17.22	19.50
70	32.67	31.83	33.87
100	18.86	18.13	20.12
140	9.80	9.24	10.61
200	2.90	1.79	3.51
270	....	....	....
Pan	....	....	....

Fig. 1—A pile of clean dry silica sand may be thought of as looking like that at left. Actually it more nearly resembles the one shown at right



tain samples of exactly 50 grams by adding to or removing from the base sample. It was felt that this procedure would destroy the value of the sample.

Data obtained from this series of tests are shown in Table II. Close examination will show a marked improvement in the deviation from the average. In the sand reported in Table I, the greatest deviation occurred on the sieves retaining the greatest amounts. In Table II, those sieves would be Nos. 50, 70, 100, and 140. The deviation here amounts to 5 per cent or less of the per cent retained on the individual sieves, as against 25 per cent in the data of Table I.

It is reasonable to expect that such duplication of data is possible in any laboratory if extreme care is exercised in sampling and testing. Segregation effects have been kept to an absolute minimum in the second case whereas its effect on samples is clearly reflected in the first case reported.

Effect on Laboratory Tests—Now let us consider the effect of segregation on laboratory tests made on bulk shipments of sand. During the last few years, the author's company has made many checks between point-of-production and point-of-use samples. Although some work has been done on damp sands, most of it concerned dry sands of low clay content.

Comparison of data between point of production and point of consumption is not always consistent, but the over-all picture is most interesting. We have found that the normal deviation from the average of the per cent retained on an individual sieve can be expected to range from 15 to 20 per cent. That is, under carefully controlled conditions, with best attention being given to sampling and testing, the consumer's test when checked against the test of the sample at the point of production will deviate by 15 to 20 per cent.

Frequently the deviation will be even greater, but under controlled conditions 20 per cent appears to be about the best that can be hoped for. We feel that this deviation can be traced back directly to segregation in transporting the sand and to improper techniques of sampling to counteract or compensate for segregation. Other sand producers agree with these conclusions.

Today no completely satisfactory technique of sampling a bulk car or truck of sand so as to obtain a truly representative sample of the mass is known to the author. Many methods have been tried but have been found wanting. Much work needs to be done in this field.

The situation, however, is not completely hopeless. The logical point of sampling a bulk shipment of sand is at the point of production. Many sand producers have spent considerable time and money to develop reliable and consistent methods of sampling and testing. Particular emphasis has been placed on sampling of bulk shipments during loading. These methods must be reliable because they are a check of the plant's production consistency, and complete operational control depends on the results.

The foregoing discussion leads to the following conclusions:

1. Many cars of sand have been rejected needlessly because of a lack of understanding of segregation and its effect on test results.

2. Specifications written on tolerances of plus or minus 5 per cent deviation from the average of the per cent retained on an individual sieve are unrealistic. Sand segregation can and does result in deviations in samples from the same car of sand of percentages far in excess of 5 per cent.

3. Few, if any foundries, would be able to detect the influence on their sand system or castings of a deviation of up to 15 per cent of the amount retained on an individual sieve. This does not apply, however, to deviations in the extremely coarse or fine sieves. Here such a deviation may have considerable effect.

Additional Effects — Table III shows the sieve analysis for what appear to be two different sands. Referring to Table I, however, it will be noted that the per cent retained on sieve No. 70 under the columns headed "High" and "Low" corresponds to that retained on the seive No. 70 for the two sands in Table III. Actually, the sieve tests shown in Table III are the results of two of the tests made in collecting the data for Table I. Both samples came from the same 100-lb bag.

Recorded below the sieve analysis in Table III is the calculated surface area for each sand in square centimeters per gram. This shows that sand No. 2 has 11 sq cm more surface area per gram than sand No. 1. Thus, sand No. 2 will require more bonding material than sand No. 1 to develop the same physical properties. The difference in surface area is about 10 per cent and the increase in bond requirements for sand No. 2 probably will be in the same amount.

Too little is known today about the relationship between bond percentages and surface area, but current studies indicate that it will be an important consideration in foundry operations before long. In present practice, the increase in surface area would reflect itself more in the use of oils and resins for cores than in clay and cereal additions to molding sand.

The important point here is that we effected a 10 per cent increase in surface area by not enforcing controls to minimize the segregation effect. This situation can account for a fluctuation of physical properties where standard mixes are used and is one of the reasons why standardization of bond additions has been so difficult.

It is reasonable to expect that when removing sand from large storage areas, variations will be much greater than those shown above. This means that we must use extreme care in storing sand and removing it from storage. Otherwise tremendous variations may result and the varying physical properties of the sands will cause inconsistent casting quality.

Surface Finish—Looking again at the two sands shown in Table III,

Care in unloading a car assists in reblending the sand and counteracts segregation when going into storage

sand No. 2 undoubtedly would produce a casting with better surface appearance than sand No. 1. This means that sand segregation can cause changes in the surface finish of castings. This is known to have been the case in many foundries and was not resolved until the segregation problem was recognized.

One nonferrous foundry is buying its sand in 100-lb bags instead of in bulk shipments. Segregation of storage sand was so serious in this plant that it was nearly impossible to establish a standard for surface finish. With bagged sand a consistent standard of surface finish was achieved.

Segregation can be detected by running dry base permeabilities of batches of new sand before bonding in the muller. Sensitivity of the permeability test reflects even minor changes in the sand distribution.

Consistent results often are difficult to attain in permeability tests on new sands, particularly in the range of 40 to 60 AFS grain fineness number. Again this may be traced to segregation of the sample as it is introduced into the specimen tube. Depending on the method of introduction of the sample, the sand may assume varying positions in the tube.

In any case, the sand has segregated and the chances of repeating the segregation in the same way and amount are remote. For this reason, in the author's plant a standard procedure for base permeabilities involves the use of a specific weight of sand to which is added ½ to 1 per cent moisture, the amount depending on the grade of sand involved. Each grade always is checked, using the same weight of sand and the same volume of water. This procedure enables us to interpret one test in light of another, and the addition of the moisture reduces the effect of segregation on the test.

One steel foundry recently reported a range of 150 to 300 in dry base permeability of samples taken from a single truckload of sand. While some of this variation undoubtedly is due to segregation in the test procedure, the major portion must be attributed to segregation of the sand while in storage. Such variations cannot help but be reflected in quality of the castings produced in the sand.

TABLE III—Test Results from One Sand

U. S. Series Sieve Number	Sand No. 1	Sand No. 2
20	0.02	....
30	0.03	....
40	2.63	1.8
50	14.75	11.0
70	44.32	31.7
100	31.45	43.8
140	5.60	10.0
200	1.00	1.4
270	0.18	0.2
Pan	0.02	0.00
Surface area, sq cm/gram	103.8	114.8

Influence on Scabbing — There is considerable reason to believe, at least in steel foundry practice, that scabbing can be related directly to an increase in fineness in the base sand. We know this to be the case in other metals, but the condition seems to be more easily reflected in steel foundry practice. Referring again to Table III and defining fineness as sand passing sieve No. 100, we see that the fineness for sand No. 2 is almost double that of sand No. 1.

In FOUNDRY for July, 1959, Page 120, Victor M. Rowell shows what effect changes in distribution have on physical properties of the bonded sand. Segregation can influence this sand distribution considerably.

Careful attention should be given to methods for minimizing segregation in existing and new foundry operations. Material handling specialists have had experience with this problem and can make many useful suggestions on how to control it.

Discuss your segregation problems with your sand supplier. Chances are that he will be able to make helpful recommendations since undoubtedly he has had to wrestle with these problems in his own operations.

Committee 8-F of the AFS Sand Division offers these recommendations as methods of minimizing sand segregation:

Unloading—When using wheelbarrows, endloaders, and grab buckets to unload sand from cars, work across the car perpendicular to the track to get as complete a cross section of the sand in the car as possible. This process will assist in reblending the sand and counteract segregation as it is placed into storage.

With bottom dump equipment segregation is nearly impossible to control at the point of discharge; blending must be accomplished from this point on to storage.

Conveying and Storing—Distance of fall onto and from a conveyor belt should be as short as possible. Wide belts and slow speeds are better than narrow belts and high speeds for reducing peaking of sand on the belt. Baffles and cones at discharge points help distribute sand uniformly throughout the storage area. Use of baffles at the discharge point of bucket elevators also is important.

With gravity flow, baffles should be used to retard the speed of sand flow and minimize the distance of free fall.

Segregation is kept to a minimum with the screw type of conveyor.

When discharging into storage, endeavor to distribute sand uniformly throughout the storage area.

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Achieving

ULTRA-HIGH STRENGTH

in Low-Alloy Steel Castings

Improvements in metallurgy and process control plus the use of ceramic molds make possible cast parts with ultimate tensile strengths up to 309,000 psi

By ROBERT H. HERRMANN
Associate Editor

Fig. 1—Heavy risering and extensive gating are needed on high strength steel aircraft and missile castings

● HIGH-INTEGRITY, low-alloy steel castings with ultimate tensile strengths as high as 309,000 psi have been produced by American Brake Shoe Co., Mahwah, N. J. These castings are for aircraft and missiles.

Although all the high-integrity castings do not fall in the 300,000 psi strength range, they do range upwards of 150,000 psi, depending on alloy used and service requirements of the part.

These complex castings, cast to close dimensional tolerances, high strength-to-weight ratios, and uniformly high quality, result from improvements in metallurgy and process control, and from a cope and drag molding method employing a ceramic mold material.

The process developments are the work of Brake Shoe Research Center engineers under the direction of Francis B. Herlihy, director of metallurgical research. Aircraft and missile castings resulting from the improved technology permit increasing the craft's useful load and lower their cost by eliminating costly "hog outs" from rough forgings. On a commercial basis, the new process makes available casting strengths that previously were attainable only in certain wrought materials.

Pattern Equipment—Conventional cope and drag patterns and coreboxes of wood or metal are used for making molds and cores. The patternmaker's shrink allowance is different, however. It is less than that used for sand molding, so that the pattern constructed for sand molding would produce a slightly oversize casting in the ceramic molding process. Very often, however, the sand pattern can be used in ceramic by altering the mounting and locating points for machining to compensate for the larger size casting which results.

When new patterns are being developed for use in the ceramic process, Brake Shoe prefers to make prototype patterns first, then adjust shrinkage allowance by varying amounts to accommodate the casting configuration. Rather extensive padding and risering are required for proper directional solidification and feeding to obtain the degree of casting soundness and quality required for the aircraft and missile castings that account for a major

Fig. 2—Cope and drag ceramic molds made in standard flasks are heated with gas-fired torches (hoses in foreground) prior to pouring to promote directional solidification

portion of the work done in the foundry.

Molding—Conventional flasks are set over patterns mounted on plates, and a slurry of fine-grained ceramic materials is poured into the flask. After a short setting time the pattern is drawn and the mold closed. Pressurized, gas-fired torches are placed over sprue and riser openings to skin-dry the mold cavity. Torches also are used to obtain different degrees of heating in various parts of the mold just prior to pouring to aid directional solidification.

American Brake Shoe's experience with the ceramic mold process indicates that it provides an inert mold material, causing no reaction with the molten metal and resulting in good casting surfaces. It provides greater latitude in casting design; thinner casting sections are permissible; the insulating property of the mold material promotes even cooling of light and heavy sections. There is no dirt from the mold to contaminate castings. This ceramic molding process, according to Brake Shoe engineers, is best adapted to producing castings in sizes from a smallest dimension of 15 in. upward.

TABLE I—Chemical Analyses of 15 Consecutive Ring Castings

	Aim	Average	High	Low
C	0.42	0.43	0.46	0.39
Mn	0.80	0.82	0.90	0.69
P	....	0.011	0.015	0.008
S	....	0.009	0.011	0.007
Si	0.45	0.46	0.55	0.29
Ni	0.50	0.53	0.57	0.48
Cr	0.90	0.88	0.90	0.86
Mo	0.40	0.40	0.41	0.39

Melting—Heats consist of electrolytic pig or sponge iron plus remelt with alloy additions to obtain the desired composition. Gating metal, which comprises most of the remelt, is analyzed before recharging. That analysis determines the amount of additions required to bring metal constituents within the desired range.

A metallurgist calculates charges on a work sheet, and the melter, using that sheet, weighs charge components precisely. He prepares a record sheet covering charging, melt down, and pouring. Heats are melted in basic-lined induction or arc furnaces and tapped to basic-lined pouring ladles.

Careful preparation of the charge and close control over the melting cycle are essential in the production of high-integrity castings. The average chemical analyses of 15 consecutive ring castings for a classified missile are shown in Table I. Table II shows mechanical properties obtained from attached coupons and dimensions for these 15 castings.

Depending on customer specifications, test bars may be attached to the castings or poured separately. These are used to check mechanical properties of the metal and heat treatment response. Metal analysis is checked from slugs poured from each heat. Wet chemistry and x-

Fig. 3—Some castings, which have substantial metal added to certain sections as is the case with the missile ring above, are machined to aid radiographic inspection

ray fluorescent methods are used for this purpose.

High-purity alloys used in high-integrity castings produced in ceramic molds have shown a reduced tendency for hot tearing. This is shown in Table III, which presents data on hot tearing tests conducted with high-purity and standard 4330 steel.

TABLE II—Properties and Dimensions of Ring Castings

MECHANICAL PROPERTIES*

	Specified	Average	High	Low
Ultimate tensile, psi	260,000	286,000	309,000	256,000
Yield @ 0.2% offset	210,000	224,500	245,000	210,000
% Elongation in 1 in.	3.0	4.5	7.0	3.0

DIMENSIONS*

	Specified	Average	High	Low
Diameter	35.072 ± 0.062 in.	35.082 in.	35.119 in.	35.008 in.

*Mechanical properties from attached coupons for 15 consecutive castings. Dimensions for 15 consecutive castings.

TABLE III—Effect of High-Purity 4330 on Hot Tearing

Pour Temperature	½-in. Fillet Radius				
	High-Purity 4330		Standard 4330		
Aim 3100° F	OK	OK	OK	OK	OK
Range 3120-3060° F	OK	OK	OK	0	X
Aim 2975° F	OK	OK	OK	OK	OK
Range 2980-2950° F	OK	OK	0	0	0
Aim 2850° F	OK	OK	X	X	X
Range 2870-2815° F	OK	OK	X	X	X

OK = no tears. 0 = small tears. X = gross tears.

Casting Cleaning—A crane removes the cope from cooled molds, lifts the casting from the drag and sets it on the floor. Cores, either ceramic or oil sand, are knocked out with air hammers. Castings then are moved into a walk-in room and blast cleaned with dry sand.

Swing cut-off wheels remove gating metal from large castings; smaller castings are set in jigs on an abrasive wheel cut-off machine. Torches are not used to remove gates because these alloys have high hardenability, and cracking might occur.

The finish cleaning of some castings is done with grinders; others, such as the missile ring casting, are machined. Castings which have had substantial stock added to promote progressive solidification are ma-

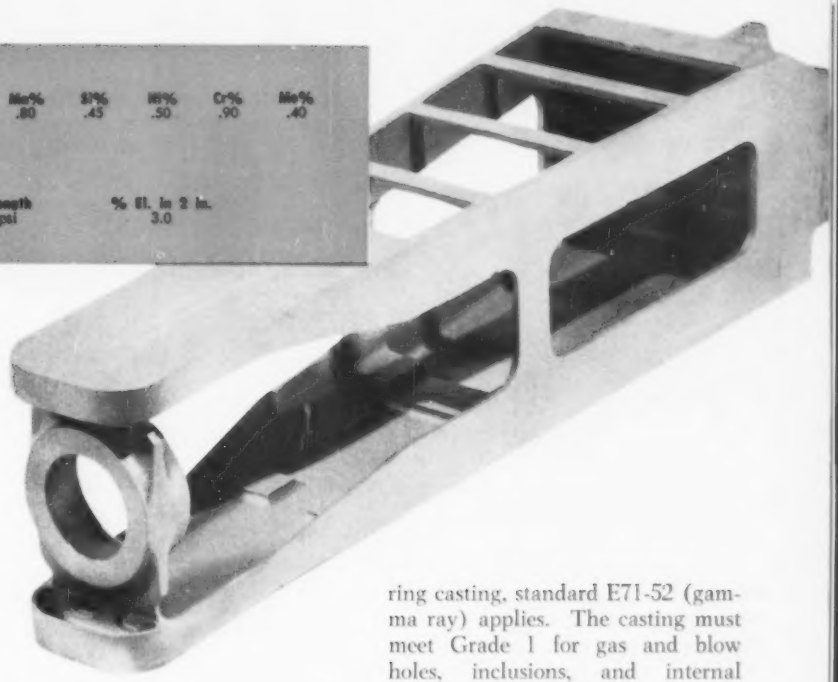
Fig. 4—Spar Fin

1. Alloy—8740 modified:

C%	Mn%	Si%	Ni%	Cr%	Mo%
.42	.80	.45	.50	.90	.40

2. Customer—Douglas Aircraft
3. Length—32 in.
4. Weight—60 lb
5. Mechanical Properties (minimum guaranteed)

Yield Strength	Tensile Strength	% El. in 2 in.
210,000 psi	260,000 psi	3.0



chined to facilitate radiographic inspection. Any defect that may show will be in the metal of the usable part and not in the excess metal which is to be removed.

Heavy risering and extensive gating are required on castings in the quality range of these missile and aircraft parts. Consequently the yield is low. On the missile ring casting shown in Fig. 2, for example, it is 20 per cent. Yield is 15 per cent for the spar fin casting shown in Fig. 5.

Heat Treatment — Castings are heat treated in accordance with MIL-H-6875A, except that no tempering temperature between 500° F and 800° F is used. When customers specify tensile strengths in the 180,000 psi range, they want the foundry to do the complete heat treatment. Customers will machine the castings at that strength level.

When tensile strengths in the 260,000 psi range are specified for castings, customers prefer to receive annealed castings, which they machine, then heat treat to the desired strength level.

In the case of the missile ring casting, Brake Shoe subjects it to 1850° F for 3 hr in a nitrogen-atmosphere electric furnace. Following air cooling the casting is brought to 1300° F and held for 3 hr, then cooled in the furnace. This second phase is an annealing treatment for machining purposes only.

The customer finishes the heat treatment at 1650° F for 1 hr in a neutral atmosphere, followed by air cooling. Next the casting is brought to 1525° F and held for 1½ hr in a neutral atmosphere, then oil quenched. The final phase of treatment is at 410° F for 4 hr, followed by air cooling.

Since the foundry provides certifications of properties based on test bar data, the bars are given the full heat treat schedule at the foundry. They do not, however, receive the 1300° F anneal because that is performed only for ease of machinability.

Quality Standards — ASTM radiographic standards for steel castings are used. In the case of the ring casting, standard E71-52 (gamma ray) applies. The casting must meet Grade 1 for gas and blow holes, inclusions, and internal shrinkage. Although this specification sets maximums for hot tears, cracks, unfused chaplets, internal chills, and other imperfections, none is allowed in the ring casting. Also, no surface imperfections as shown by Magnaglo indications are permitted.

All castings are subjected to Magnaglo and radiographic inspection before heat treatment and are inspected again with Magnaglo after heat treatment.

General Considerations — Many investigations indicate that the best combination of tensile and impact properties is obtained when steel is heat treated to give a tempered martensite structure. Alloying elements

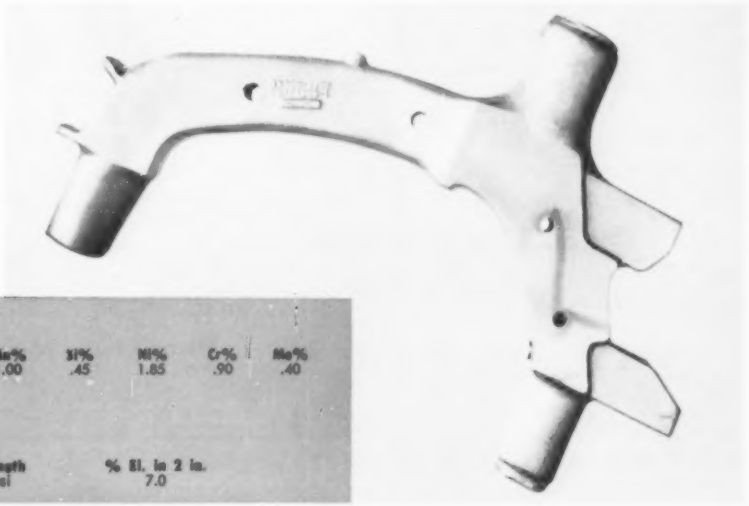


Fig. 5—Pylon

1. Alloy—4330 modified:

C%	Mn%	Si%	Ni%	Cr%	Mo%
.27	1.00	.45	1.85	.90	.40

2. Customer—Grumman Aircraft Engineering Co.
3. Length—27 in.
4. Weight—65 lb
5. Mechanical Properties (minimum guaranteed)

Yield Strength	Tensile Strength	% El. in 2 in.
160,000 psi	180,000 psi	7.0

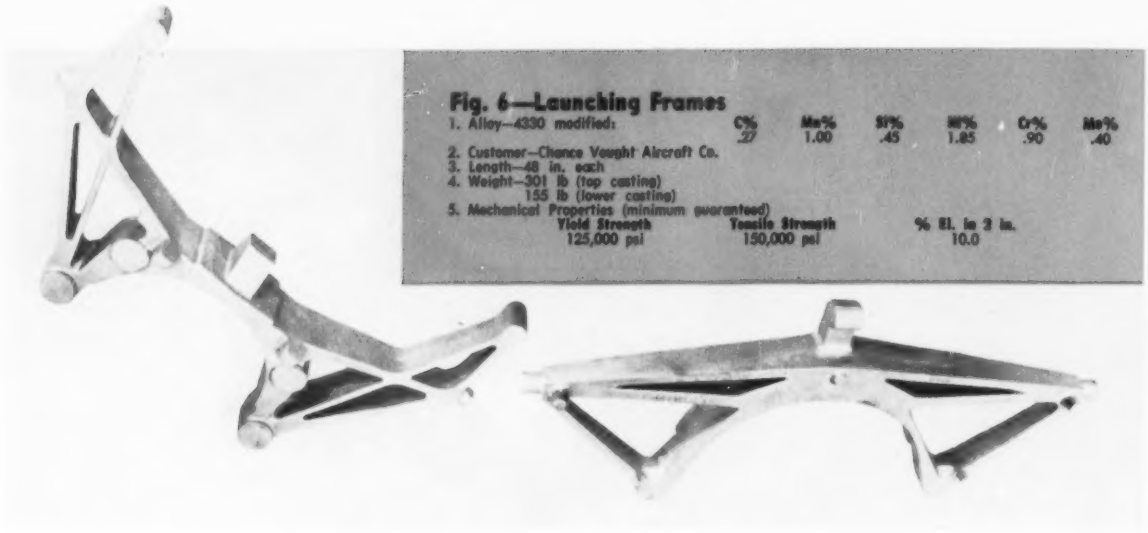


Fig. 6—Launching Frames

1. Alloy—4330 modified:

C%	Mn%	Si%	Ni%	Cr%	Mo%
.27	1.00	.45	1.85	.90	.40

2. Customer—Chance Vought Aircraft Co.
3. Length—48 in. each
4. Weight—301 lb (top casting)
   155 lb (lower casting)
5. Mechanical Properties (minimum guaranteed)

Yield Strength	Tensile Strength	% El. in 2 in.
125,000 psi	150,000 psi	10.0

are used in steel to obtain this martensite structure in heavier sections. However, alloy additions lower the temperatures of the start and finish of the martensite transformation. Consequently, highly alloyed steels tend to have retained austenite in the final structure. This austenite may transform in service to produce untempered martensite and contribute to premature failure. Even if untransformed and present in sufficient amounts, it affects tensile properties.

At Brake Shoe, experiments with alloy variations in heats of 4340 steel showed that overalloying was detrimental, particularly at the highest strength level. Relatively little effect on tensile strength and ductility was noticed, but a definite effect was noted on yield strength. Also, impact strength possibly was affected.

Experimental work performed under the sponsorship of the Wright Air Development Center also showed that an advantage is obtained in ductility and impact strength when high-purity charge materials are used as compared with normal purity heats. This may be explained by the lower sulfur and phosphorus contents of the high-purity heats. However, a conflict was noted in the data from the high-purity heats to which sulfur and phosphorus were added. Castings from these heats showed little difference in tensile properties at the high-strength level. This phenomenon is still being investigated.

Exceptionally high strength levels require exceptionally high casting quality. The high-purity metal charges at Brake Shoe involve use of electrolytic iron at about 30 cents a pound and sponge iron briquets costing about 15 cents a pound. The ceramic molding process is more expensive than some other production methods. In addition, careful application of good foundry techniques and close control over all processes are required. In the production of aircraft and missiles where top quality is required, economics are important only in relation to the ability of a process to produce a part of the desired quality to meet the desired need.

It has been Brake Shoe's experience that melting high-purity charges in air is cheaper than melting them in vacuum, although vacuum melting is considered feasible for many applications. In addition, the pouring of high-purity heats in ceramic molds has resulted in castings with fewer tears and cracks. It is felt that the reduction in these imperfections probably offsets the higher cost of materials.

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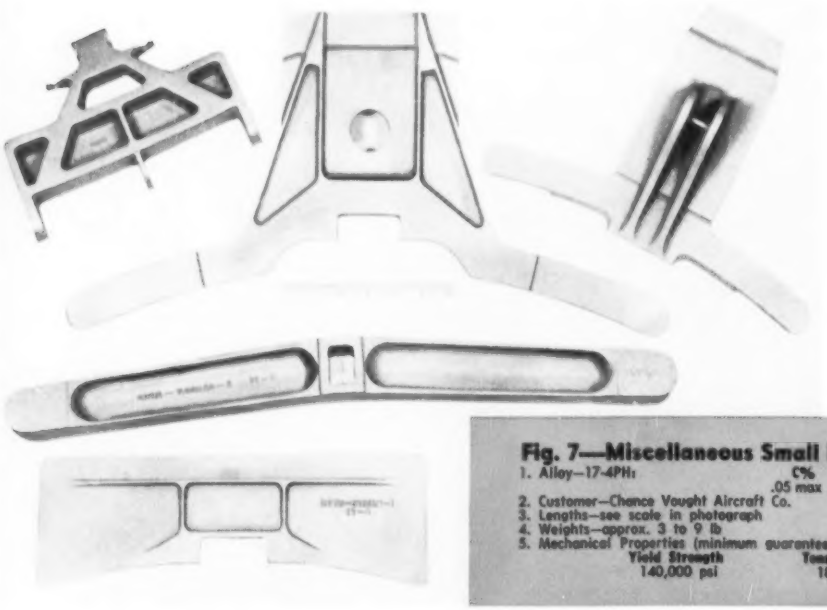


Fig. 7—Miscellaneous Small Fittings

1. Alloy—17-4PH:

C%	Mn%	Si%	Ni%	Cr%	Cu%
.05 max	.40	.60	4.35	15.75	2.65

2. Customer—Chance Vought Aircraft Co.
3. Lengths—see scale in photograph
4. Weights—approx. 3 to 9 lb
5. Mechanical Properties (minimum guaranteed)

Yield Strength	Tensile Strength	% El. in 2 in.
140,000 psi	180,000 psi	6.0

How To Use a . . .

MANAGEMENT CONSULTANT

What do consultants do? When do you need their help? How can you pick out the right man? Here are answers to common questions about consultants

By MARSHALL DYER
Assistant to the President
Trundle Consultants Inc.
Cleveland

● DO YOU know under what circumstances your firm can use a management consulting service, how to select a consultant service, and how to get the most benefit from it?

It is safe to say that industry management usually is somewhat reluctant to ask pertinent questions about people who might serve it in a consulting capacity.

Five Points To Cover—This article will try to answer some of the common questions about what makes consultants tick, what they can and cannot do for you, and what steps management should take to insure that it receives maximum benefit for the dollars that it spends on consulting service. There are five areas to consider:

1. When a company can use management consultant service profitably. In this section, not much attention will be devoted to the company which has a fire to put out. We will consider a company which recognizes a potential fire in the distant future and intelligently takes steps to remove the cause. The man with the fire to put out needs one of two things—a consultant six months ago or a sympathetic banker today.

2. Selection of a consultant—what type of consultant and what type of firm you should contact.

3. How to organize to start a consulting assignment so that minimum time is lost by your personnel, yourself, and the management consultant.

4. How management can stay on top of a consulting job—stay abreast of what is being done, without impeding its progress—and how the client can accomplish the maximum amount of training and broadening the viewpoint of his people.

5. How to insure that you have the best long-term results from the recommendations of the consulting assignment.

Scientific Management — To review quickly one of the major reasons why American business this year will pay $550 million for consulting service, one must remember that managers themselves have created the concept of scientific management.

As a result of this trend, the science of management and the knowledge required to carry out most successfully all of the functions of modern management have grown to a point where it is virtually impossible for any one person who has to keep a company's head above water, to become an expert in all of the functions.

Now, I'm not sure that some of the more traditional foundries have begun to suspect this fact, or at least have admitted it to themselves yet. National gray iron tonnage figures indicate no particular decrease in the tons of castings poured by the entire industry, but foundry after foundry has closed its doors. This condition indicates that the people who are approaching this thing from a team standpoint, with, more or less, a group of management specialists co-ordinated by one top man, increasingly are taking the patterns and work away from foundries that are sitting back and waiting for the work to come in.

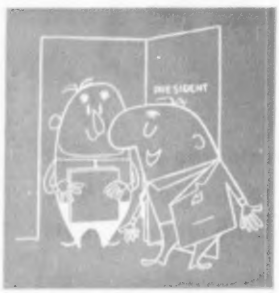
This trend has created the demand for consulting service. People who are in the consulting business probably are basically no smarter than the people who are operating successful industrial plants. They do, however, have one thing in common that is uncommon to industrial management: They can listen to, study, and evaluate the complex set of circumstances which every company presents. They also can diagnose and analyze the fundamental problems involved, instead of confusing problems with symptoms.

They then can design a program to correct this problem with a minimum disruption of day-to-day activities. This program must consider the effect on all functions of the business, rather than just on the one which seems to be giving trouble at the time. Further, it must not confuse the functions that people are supposed to be perform-

ing with the personalities who are assigned to those functions.

Fields of Consulting — Management consulting breaks down generally into about seven different fields in which you'll find that most consultants practice.

1. Management and organization problems. Few managements can



sit back and say, "We are organized to take care of any situation that comes up. We are getting the very best out of each one of our people. Our people, in relation with each other, are functioning completely harmoniously. Every position in the company is backed up by a person who is as capable as the present incumbent or better."

2. Production problems. This field covers such things as layout, material flow, shop organization, supervision, standards of performance, incentives, production control, equipment specification, and inventory policy.

3. Marketing—that is, getting the pattern for molding the casting in the first place. Marketing probably should be given top priority by foundry managements because few smaller foundries actually are doing any real marketing. For a long time, a foundry that produced good castings at a reasonable price was able to count on a considerable flow of business coming in automatically. That situation seldom exists today.

4. Finance. The complexity of reports required and of the laws behind them has grown greatly in the last 20 years. This field historically has been that of the president of the foundry; today, he no longer has time to keep up with the legislators.

5. Personnel selection and evaluation. Few foundry managements don't express the thought that if they had slightly better supervision or could attract higher quality workmen, all their problems would be solved and they would grow by leaps and bounds. Scientific tools have been developed to evaluate people, their aptitudes, their interests, and where they will make the greatest contribution to an organization.

6. Office procedures and methods. If you want a very simple, home-style reason for office methods consultants, take a good look at your office. See whether your office personnel don't just about equal the number of people you have molding.

7. Government work. As everyone knows, the number of government employees—municipal, state, county, and federal—has been increasing as laws, counter-laws, and corrective laws are added to the books yearly by our legislators.

You probably are wondering how these points affect you and what you should do about it in your foundry. When do you need a consultant? Why do you need a consultant (which is probably even more important)? What good will he do you?

When You Need a Consultant—Here is a checklist of things that you might look for to determine when you need a consultant:

1. Is your foundry growing each year in terms of dollar sales, but losing ground in terms of tonnage poured? If you are not holding your percentage of the total growth in the foundry industry, actually you're losing ground.

2. Does the present chief executive officer of the foundry feel that although he has some promising young men coming up behind him, he is unable to leave them in charge of the foundry very long?

3. Are you prevented from buying equipment to reduce costs because of a shortage of capital or because, as a matter of policy, you do not borrow money?

4. When you go out into your foundry just before pour-off time, does a chaotic scene greet your eyes?

5. Are you bidding on just as many jobs as you ever did, but is the ratio of bids to work secured dropping off?

6. Are your customers, the people with whom the president has been doing business for the last 20 or 30 odd years, retiring and being replaced by new faces in the customer companies? You must resell these new people on your excellence as a supplier, or you must locate new potential customers.

7. Have you been unable to find personnel with either the free time or the ability to make a change or improvement in your foundry which you have wanted to make for a long time?

Selecting the Consultant—On the basis of the foregoing checklist, you may have decided that *when* is now. The big question is *who?* It's obvious, with about $550 million having been spent this year on consulting services that there must be a considerable number of firms and individuals offering services.

One thing which you might consider is this: There is a group of management consulting firms in the Association of Consulting Management Engineers founded in the early 1930s to establish and maintain the standards of professional consulting. Membership in this organization carries at the very least an endorsement by the principal firms in the country that a consultant or organization is well qualified to handle consulting assign-

ments within your field.

Nonmembership in the Association of Consulting Management Engineers does not mean that a firm is incompetent. Some firms and specialists do excellent work whose size or recent organization disqualifies them from membership in the association.

Basically, there are two major size splits in the consulting field. A few bigger companies are made up of more than 100 persons each. Then there are smaller companies who probably average eight or few-

er consultants. These divide into the following types: 1. Broad-gage companies which, because of their size and experience, are equipped to handle almost any corporate problem in almost any industry that you care to name. 2. People who specialize within an industry in the broad-gage services. 3. The type which specializes in a specific field, but serves all industries.

The advantage of a large consultant organization is that practically any problem which may

come up can be handled by a member of the one firm. This ability eliminates the duplicate setup of educating a number of specialists to the particular circumstances in your firm. The advantage of a small firm, however, is that usually you personally are dealing with the principal of the firm.

Now that you have decided what type of company that you're interested in retaining, the next step is to invite several consulting firms in to discuss or define the problem with you.

After this preliminary screening, the next step is to determine the quality of work done by the firm you're considering. Anyone giving you references certainly is going to give you the names of satisfied clients. Therefore, it will probably be a good deal more productive for you to get unbiased opinions from people who have had personal experience with the consulting firm.

Preplanning — Now let's assume that you have satisfied yourself about the type of work done by the one company you have decided to talk with seriously. The next thing to look for is the amount of attention that the consultant pays to carefully preplanning the job with you, defining what is going to be covered and what is not going to be covered, how much time is going to be devoted, and approximately how much money will be involved in consulting fees. This step is extremely important because, in the first place, a man who knows exactly what he is going to do, and in which sequence he plans to do it, generally is competent to handle your particular problem.

Once you have decided to go ahead on the program as outlined, the next step is to get started. As a word of caution: Be absolutely sure before the work is started that you understand the implications, the objectives that the consultant has set up, and the limits that he has set for himself and your organization. You further should make sure that any of your people who are even remotely involved have the same familiarity with what is to be done and why.

Assuring Success — Three other things are highly essential: 1. One company executive should be appointed as a contact man for the consultant's personnel. 2. Sufficient clerical staff should be furnished by the company to insure the greatest return to you for the time the consultant spends in your organization. 3. A quiet and private place to work should be provided.

In connection with these points, it is important that you assign at least one of your promising management trainees to work full time with the consultant. The training and the broadening of viewpoint which will come from this association often are worth the whole price of the job. Further, having been through all of the steps in thinking in the assignment, your representative will be more competent to carry on and implement the recommendations made by the consultant long after he is gone.

One more point will help you get the best from your consulting expenditure. Many companies feel that because of the fee which they are paying for the service of a consultant in the plant, he should be a fountainhead of wisdom who erupts at least once daily with some gem of wisdom, information, or technique. Remember that the consulting firm selected the man assigned to you because he is unusually competent in the field covered by the original assignment, but not necessarily in all fields of management and philosophy. What I'm saying, in effect, is that it is unfair to expect anyone to be a hero every day.

Two important management attitudes contribute greatly to the performance of a successful consulting assignment. First, during the period that the consulting people are working with you, there will be extra demands on your time and on the time of your executive group. Consulting, by definition, means that two or more minds are working together on a problem. Although the consultant may have specialized experience in methods of solving certain problems, he will be much more effective if his thinking is combined with your much greater experience in your particular industry.

Second, I think you must face the fact that a problem or situation on which you are using a consultant has taken a good many years to develop. Its correction is not going to be an overnight process. You should, however, insist on regular progress reports to reassure yourself that a solution is in the making and to determine its progress.

The Followup—It is crucial that provision be made for followup of the results obtained through a consulting assignment. Doing this as-

sures that your organization is following the correct procedures and is not "improving" whatever was installed to a point where it no longer is useful. Your people should not be allowed to shrug off whatever may have been established as soon as the consultant is out of the picture. Provision should be made for this followup, and it should be made known to all the people in your organization early in the job.

This paper was presented before a meeting of the Cleveland Management Group, Gray Iron Founders' Society.

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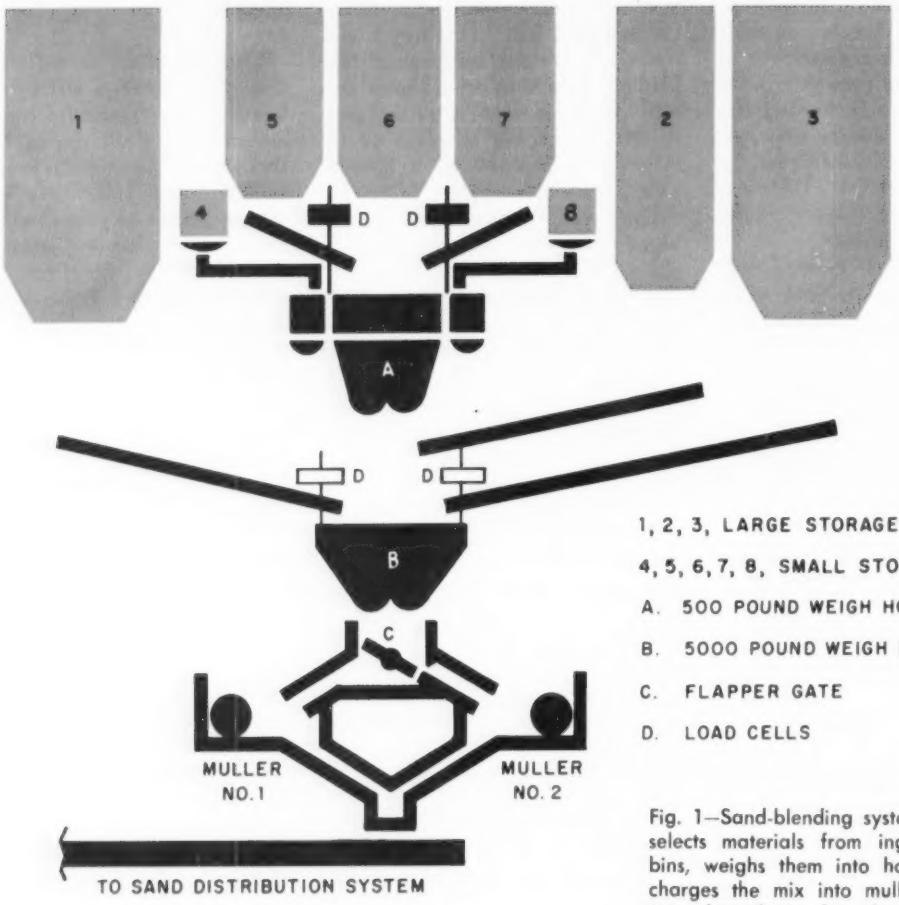


1, 2, 3, LARGE STORAGE BINS

4, 5, 6, 7, 8, SMALL STORAGE BINS

A. 500 POUND WEIGH HOPPER

B. 5000 POUND WEIGH HOPPER

C. FLAPPER GATE

D. LOAD CELLS

Fig. 1—Sand-blending system automatically selects materials from ingredient storage bins, weighs them into hoppers, and discharges the mix into mullers for distribution throughout the plant's sand system

Pushbutton System

Mixes Sand Automatically

Batching system can mix any preset quantity of sand as needed from storage bins. Unit permits rapid switching from one mix to another and permanently records the weight of each ingredient in every batch

By FREDERICK R. MOREY
Product Engineer
Leeds & Northrup Co.
Philadelphia

● AT THE TOUCH of a single button, a sand-blending system automatically mixes up to eight foundry sand ingredients in quantities as high as 60 tons per hour at the Eddystone, Pa., plant of General Steel Castings Corp.

This versatile batching system can mix any preset quantity of foundry sand, in any combination of the eight ingredients, in about 90 seconds. Eight different mixtures are kept in the system's "memory" and can be ordered simply by pushing the proper button. Because new mixing programs are easy to set up, specifications for ingredient composition, moisture, and mulling time can be changed, and experimental sand mixes can be made.

The exact weight of each ingredient in each batch is recorded on Leeds & Northrup Speedomax instruments. Thus a permanent record of each batch is available to provide supervisory personnel with information about batch composition and floor demand.

Many Mixes Needed—Since no one combination of sand and bonding agents fulfills all requirements, facing sand, backup sand, and core sand must be mixed specially. Different combinations of new sand, old sand, binders, and other sand additives are needed.

To meet these needs, most foundries keep on hand a supply of several different mixes. Floor storage of large amounts of mixed sand does not, however, permit most efficient use of space.

For these various reasons, a system which mixes sand as needed permits more productive use of costly floor area. Because no such system existed, General Steel Castings decided to build its own. Working in co-operation with National Engineering Co., Chicago, and Leeds & Northrup Co., Philadelphia, General Steel designed and developed the present system.

The first step was to study sand requirements. Investigation showed that a total of eight sand mixtures would be needed, each compounded of up to eight ingredients. Proportions would have to be changeable at will for maximum flexibility, and the system would have to permit rapid switching from one mix to another.

Most important of all, the system needed to be as automatic as possible, yet allow manual operation, if required.

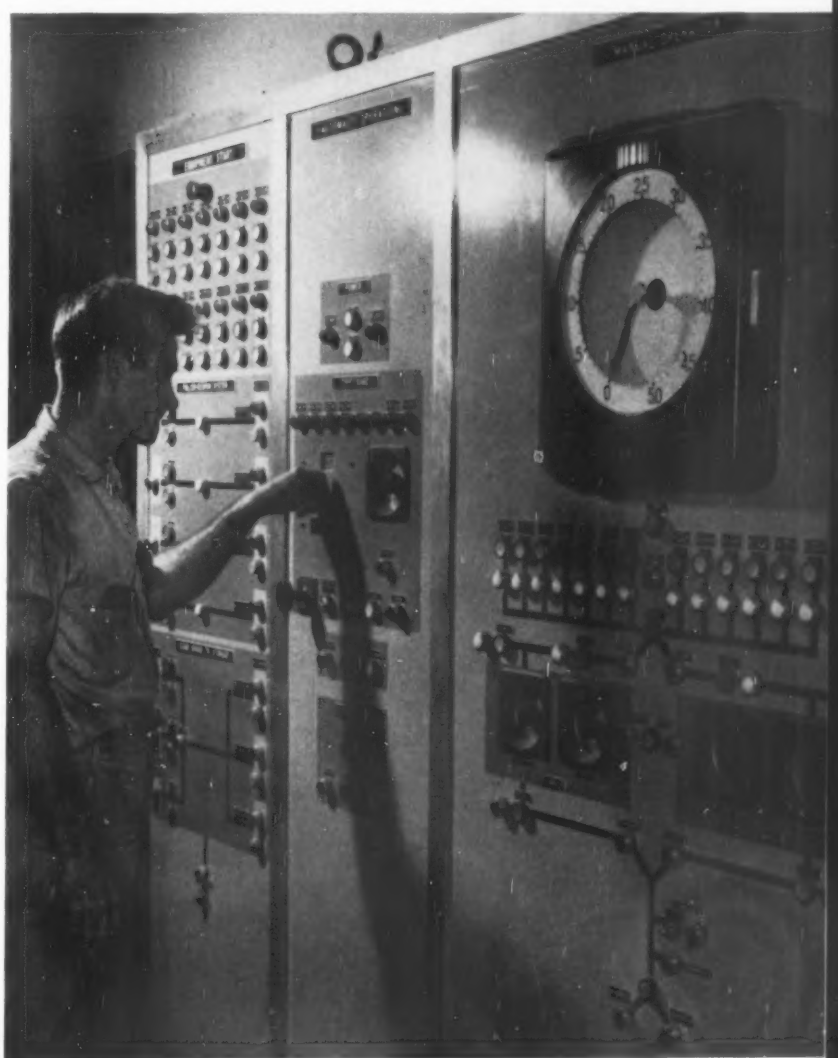
The system now in use, Fig. 1, meets all these requirements. Ingredients are stored in bins (1 to 8) which are refilled automatically whenever their level drops below a certain point. Heavy materials, which constitute the major part of each sand mix, are stored in bins 1, 2, and 3, and feed directly into a large weigh hopper, B. Dry bonding agents are stored in smaller bins—5, 6, and 7—and empty into a smaller weigh hopper, A. Tanks 4 and 8 introduce liquid bonding agents into the small hopper, A.

Each hopper is suspended from four steel rods, with a Baldwin-Lima-Hamilton load cell, D, in each rod. Two of these load cells are shown in Fig. 3. Operating in tension, they are connected in series to the measuring circuit of a recorder. The recorder indicates and records the weight of each ingredient as it is added and the total net weight of the material in each hopper.

Rubber shock mounts protect the weighing system from building vibrations and equalize load cell weight distribution. Air lines and liquid ingredient feed lines are rubber hoses so that no extraneous forces are applied to the load cells to affect measurement accuracy.

After the correct amounts of material have been weighed, they are discharged into either muller No. 1

Fig. 2—Main control panel from which all operation and monitoring is performed. Operator positions the dial to select the mix to be prepared by the system. Buttons to the right allow manual control



or No. 2, as selected by flapper gate C. Water is added automatically in the mullers, according to the original moisture of the sand. In this way, sand is always delivered at the desired moisture content. After intensive mulling, sand is dumped through a gate at the bottom of the muller into the plant's sand distribution system.

Main Panel Controls Operation—Two control panels are used with this system. One is a main panel from which all operation and monitoring is performed, and the other a subpanel on which weight programs are set and batch records are kept.

The main control panel, Fig. 2, is the control center for the system. Colored lights, left, indicate whether supply bins are filled, ready for filling, or in the process of filling. Although this system is automatic, buttons are provided, right, to allow any step to be carried out manually. Power supply lights and buttons are located in the automatic operation panel, center, which also mounts the main operating controls.

Operating controls include an eight-position selector switch which allows the operator to dial in the mix to be prepared. Next to this is a counter used to set the number of batches to be made. In this same area are the start and hold buttons, manual-automatic switch, and controls for manually operating the mullers and water feed equipment. All controls for running the system manually are on the right side of the panel.

These controls include a weight indicator, which can be operated from either hopper, and pushbuttons to feed any of the eight ingredients. Sand distribution controls are at the right of this panel section.

Mixes Set on Subpanel—The main control panel controls operation of the system, but a weight control subpanel is used to establish mixture programs and to record system performance. Sixty-four setter dials are arranged in a square pattern on this subpanel. Sand-mix types are listed beside each of the eight horizontal rows, and ingredients are labeled across the top of the square. Thus, mixtures are entered into the system's "memory" by setting the appropriate dials. For convenience, each of these dials is calibrated directly in pounds. Once the standard mixtures have been set, there is no need to readjust these dials unless a new or experimental mix is wanted.

On the rear of this panel, under the main setter dials, are eight dribble adjuster dials. These auxiliary setters bias the control settings to compensate for the weight of falling material that is in mid-air after the feed has been shut off.

Two recorders mounted left and right on this subpanel indicate and record weight in the large, 5000-lb hopper and in the smaller, 500-lb hopper, respectively. Because these

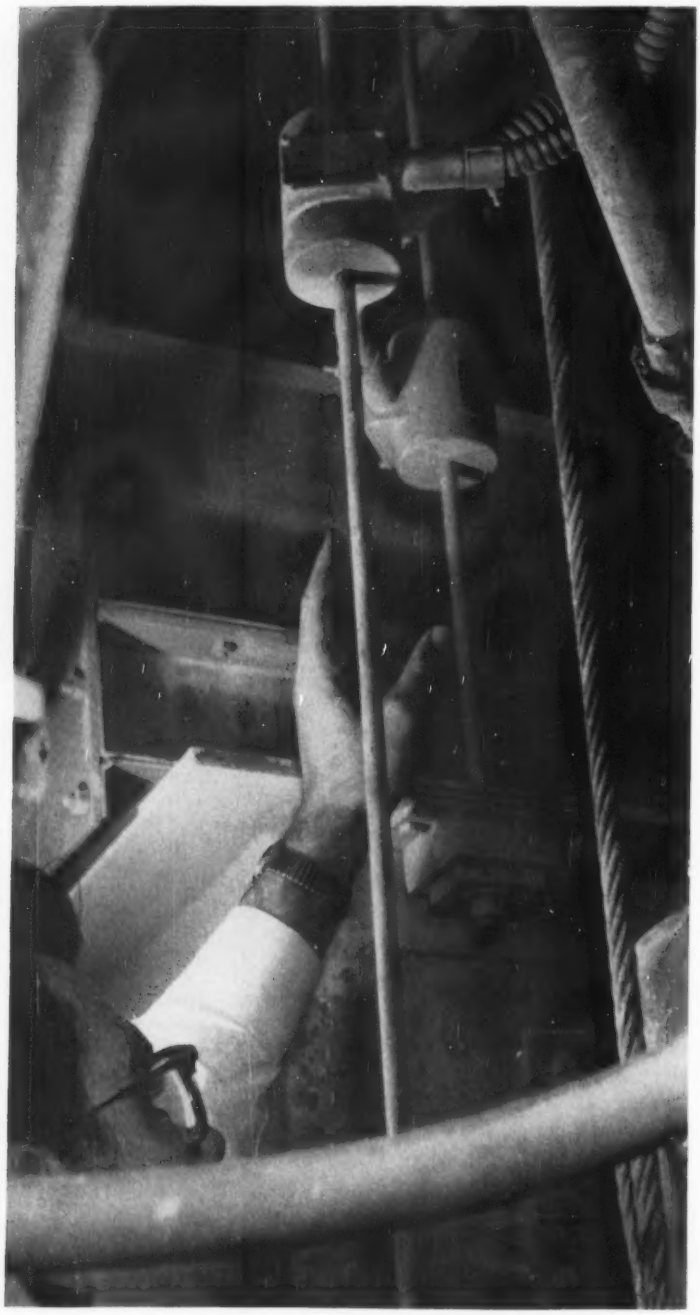


Fig. 3—Each hopper is suspended from four steel rods with strain gage load cells (two are shown) operating in tension to measure hopper tare weights

instruments operate independently, the system can weigh heavy and light materials simultaneously.

Recorders print a numbered dot on the chart at each final ingredient weight value, with the printed number corresponding to the number of the ingredient setter in use. Setters are sampled successively by a motor-driven switch mechanism similar to that used in a standard multiple-point recorder.

Typical Sequence—Here's how a typical sequence operates. Suppose that ten batches of mix A are required, consisting of a combination of materials 1, 4, 5, and 8. Since mix A is one of the eight standards, its required weights have been set previously on setter row A on the subpanel, and no further adjustments are required. The operator starts the system by setting the mix selector to A and the counter for ten batches. Recorders are zeroed, the power is turned on, and the start button is pressed. From this point on, all operations are sequenced automatically by the control system.

Ingredient 1 begins to feed into the 5000-lb hopper and ingredient 4 into the 500-lb hopper. When the scale pointer of the 500-lb recorder reaches the weight value set for ingredient 4, the feed stops and the recorder prints "4" on the chart. The switching mechanism then connects setter 5 to the control circuit, feeding ingredient 5 into the light hopper until its set weight has been reached. The weight of ingredient 5 is then printed and the switch advances to material 6.

Since materials 6 and 7 are not needed in this mix, their feeders will not operate, and the switch mechanism continues to advance until a required material is reached. In this instance, ingredient 8 will then be fed until its set value has been reached.

The material weight will be recorded and the recorder will return to point 4 to complete the cycle. Before the system returns to point 4, a relay is energized to prevent the recorder from feeding any additional material until the hoppers have been discharged.

Meanwhile, the 5000-lb recorder has been feeding ingredient 1 to the heavy hopper. This and all other heavy materials are fed at two rates of speed. First, feed is fast until the weight nears the set point. A slow speed then is used to fill the hopper to the control value. The last few hundred pounds thus are fed slowly until the control point has been reached. Otherwise, this recorder advances from material to material in the same manner as the 500-lb recorder.

When the cycle-ending relays in the two recorders have been energized, a "Full-Weight" light on the main panel comes on. Because there is an empty muller, the weighing hopper dump gates are opened, and the material is discharged into one of the mullers. The weighing recorders then read zero, the gates are closed, and the cycle then is repeated.

Fig. 4—Weight control subpanel is used to establish mixture programs and record system performance. Operator presets standard or experimental mixes by dialing in the right combination of materials

The second batch, when completed, enters the other muller for mixing and addition of water. When the third batch has been weighed, the system waits until a muller is empty and the entire cycle is repeated until the preset number of batches has been weighed and mixed.

After the last sand batch has been mixed, the system shuts down and waits for further instructions. At any point in the sequence, another mix and batch count can be set and the system will make up the new mix after the current batch has been finished.

● For an extra copy of this article, until supply is exhausted, use card on Page 53

Questions and Answers

Disturbance of molten metal on addition of deoxidizing agent indicates presence of a gas former . . . Procedure in developing patina or color on bronze is referred to as oxidizing . . . Describes core practice for radiators

Addition Causes Splashing

We deoxidize our bronze melts with 15 per cent phosphor-copper, and for some time have been placing that material in pieces of 3/4 in. copper tubing 6 in. long, closed at one end. Five inches of phosphor-copper in a tube gives us the right amount. The open end of the tube is fitted over a pointed bar, and tube and contents immersed in the molten bronze. Tubing is obtained as waste from another department, and we have had good results up until a few weeks ago when we ran into trouble from splashing. As soon as we dip the tube under the surface, the reaction is so severe that the metal splashes high. We cannot find any clue on why the reaction suddenly became so explosive. We are sure that the material and tubes are dry and clean, but that does not improve conditions. We treat the metal at around 2200° F.

Your statement that an explosive reaction results when the tube containing the phosphor-copper is plunged into the molten bronze indicates that some gas or vapor forming material is present, and the question to be answered is what it is and its source. Possibly it might be due to the air in the tube being raised rapidly to the temperature of the molten metal which results in an appreciable pressure increase. However, for that possibility several conditions would have to be met including an air-tight seal at the closed end of the tube as well as at the other end where the pointed bar is fitted in, and the tube would have to rupture suddenly.

While you mention that the tube and material are dry and clean, we suspect that the difficulty is due to moisture—not visible, and unsuspected since it is contained in some hollow material formed during the manufacture of the phosphor copper shot. The moisture remains within the shot until the heat of the molten metal converts it to steam, and then raises the pressure of the steam to the point where it bursts the surrounding metal skin. You might try heating or drying the shot at various temperatures, and observing the results obtained when placed in the copper tubes and immersed in the molten metal.

Obtaining Oxidized Finish

We have a call for some oxidized brass castings, and would like to have information on what is meant and how it is accomplished.

The term oxidizing or oxidized finish in reference to copper-base alloy castings means a coloring process which provides a brown coating similar to that resulting from long exposure to the atmosphere. The first step is to see that the castings are free from grease, oil or dirt, and that can be accomplished by immersing them in a hot caustic bath composed of 5 lb caustic soda or lye in 12 gallons of water. Length of time required will depend on the condition of the castings, but probably 15 minutes immersion will suffice. Following that the castings are rinsed thoroughly in running water at room temperature.

After rinsing the castings are pickled by immersing in a nitric acid bath for five minutes. The acid bath is composed of 1 part commercial nitric acid in 50 parts of water by volume. At the end of the pickling period the castings again are rinsed thoroughly in running water, and transferred immediately to the coloring bath. That is a sulfide bath made by diluting commercial ammonium sulfide solution with an equal volume of water. Since cold baths take a long time to develop the color which may range from light brown to black depending upon the length of immersion, it is preferable to heat the solution to around 180° F. Castings should be inspected from time to time until the desired color is obtained. Then they are rinsed in warm water and dried in sawdust.

Making Cores for Radiators

We intend to begin the manufacture of cast iron steam and hot water radiators in our foundry in New Zealand, and since this is a new venture for us, we would like to obtain as much information as possible. Our experience with such extensively cored thin-section castings is limited, and we do not know if we can make such cores without reinforcing. If the latter is possible what kind of core binder is employed? We have established the fact that we can blow these cores, but as yet have not been able to produce one that does not blow back through the metal. Another question is on the method of supporting the core—a general description would be appreciated.

While you do not give any details of the method of blowing your cores, we assume that you are producing them in one piece as a solid core. If that is the case, the difficulty undoubtedly arises from the lack of venting although lack of permeability may be a contributing factor. Lack of venting might be overcome by making the core in halves with the blowplate containing ribs which form grooves or vent passages on the joint side. The half cores then could be "booked" as described later. However, we doubt whether such a procedure would be economical.

Cores for steam and water radiator sections usually are made by hand without any reinforcement by

the procedure known in foundry parlance as "booking," and the core binder used is linseed-base oil. Booking involves joining the core halves in the green state without spilling any of the sand. The term is derived from its similarity to the operation of closing an open book by lifting the covers simultaneously in vertical arcs with the backbone of the book resting on the table.

In practice for producing radiator cores two edges of the half coreboxes are placed together to form the backbone or pivoting point. Then the outer edges are raised simultaneously in vertical arcs, maintaining the inner edges in close contact, until the two faces of the corebox halves come together. Complete corebox is lowered so that it rests flat on the bench, and the top half-box removed. A core drier is placed in position, the assembly rolled over, and the other half corebox removed, leaving the core in the drier. Drier and core are placed in the oven to bake. Coreboxes and driers usually are made of cast iron. In some shops driers are dispensed with, and the cores dried in one of the corebox halves. However, we believe the use of dryers is preferable because it permits keeping the corebox interior smooth and clean.

Since the cores are symmetrical, the half coreboxes are alike, requiring one half pattern for their production. Because the cores are supported along the bars or columns by wire-type coil head chaplets about 6 in. apart, the coreboxes contain small projections about $\frac{1}{4}$ in. square and 0.012 in. high, spaced the same distance along the bars, to provide flat areas on which the chaplets rest. Those areas are for the placement of similarly sized pieces of thin, tinned sheet steel, commonly called "tins" or core plates. Usually the tins only are placed on the top side of the core after it is placed in the mold to prevent the chaplet from piercing the core due to upward pressure of the molten metal on the core.

Sand used for radiator cores in this country usually is clay-free silica sand of about 50 AFS fineness number bonded with a good grade of linseed-base core oil. The ratio of binder to sand may vary from 1:80 to 100 by weight and you will have to experiment to determine the most suitable ratio. Amount of oil should be kept to a minimum to hold gas generation to the lowest quantity, but sufficient should be present so that the cores are strong enough to be handled without breakage. One practical method of ascertaining the latter is to pick up a core by one end and hold it out horizontally. It should be able to stand that without breaking.

In making the cores the usual practice is to scoop the sand from the pile on the bench onto the corebox leaving a mound of about 1 in. over it. The sand is pressed into the box by patting firmly with the palms of the hands. The sand is struck off or strickled level with a suitable metal bar. Then vent passages are made by use of a vent plate. That is a flat plate containing projecting, semicircular ribs about $\frac{1}{4}$ in. in diam arranged to provide grooves or vents in the centers and around the ends of the half cores. The ribs are joined and lead into a $\frac{3}{8}$-in.-diam projection on the vent plate which goes all the way through the coreprint forming the water or steam inlets. In this country steam sections contain a single inlet while hot water sections contain two—top and bottom. In the latter the vents lead to the two prints. In passing it might be mentioned that the vent plates contain pins at each end which fit into bushings at the ends of the corebox so that the vent passages are located properly.

After both half coreboxes are vented, the edges are placed together, "booked," and lowered onto the bench. Top corebox is rapped and carefully raised vertically so as not to disturb the sand. The dryer is placed in position, the assembly rolled over, and the corebox now on top is removed. Core is ready for baking.

As mentioned earlier the cores are supported in the molds by wire-coil chaplets although flat coil or plate head chaplets may be used. Stem diameter is about 1/16 in. and the chaplet is about 1 in. long. The chaplets are set by hand in holes of the proper diameter drilled along the centers of the columns about 6 in. apart. In two or three-column water sections the coreprints at both ends form the support in those areas, but in steam sections with only one inlet, the opposite end has to be supported by chaplets. Radiator sections wider than three columns will require chaplets on the ends for additional support to the prints.

Cores for cast iron radiator sections usually are made on the bench

Again it may be pointed out that since radiator sections are symmetrical only one half-pattern is required for production of drag and cope molds, usually two half patterns are mounted parallel on a plate. Patterns are gated at one end by several flat finger gates about 1 in. wide and 1/16 in. thick where they join the pattern. Those taper up to a curved runner bar about $\frac{1}{4}$ in. thick. Since half of the gate is in the drag and half in the cope, the thicknesses are twice those mentioned. Runner bars contain holes in which the downsprue formers are inserted

when making the cope molds.

Pattern plates are mounted on four-legged stands about 18 in. high which are moved down the floor as the molders use up the sand piled in a long heap on the floor. Stands are equipped with four lifts near the ends of the longest sides. Those are actuated by bars and eccentrics to lift the flask straight up about an inch or so to clear the pattern.

Beneath the holes drilled in the patterns for the chaplets are adjustable stops which are set so that the chaplets project from the mold face the exact thickness of the metal section or 3/32 in. As mentioned earlier the small, thin tins or core plates are placed only on the upper surface of the core. Those are about 0.012 in. thick, and the flat areas on the core are such that the tops of the tins are flush with the adjoining curved surface of the core. Some other details of manufacture of cast iron steam and water radiator sections are described in the article "Thin-Section Work Involved in Radiator and Boiler Castings" which appeared in the April, 1956, issue of FOUNDRY.

Cooling of Cast-in Tubing

Can you supply us any information on the technique of chilling or cooling stainless steel tube coils around which molten copper or brass is poured?

You do not mention why you want to cool or chill the stainless steel tubing, but apparently you are having trouble with the metal cutting through or perhaps with the coils shifting around. If it is the former, it appears to us that a change in gating so that the metal stream does not impinge directly on the coil is a much better procedure than trying to water-cool the coil. If the coil shifts or "snakes" around from expansion due to the heat of the molten metal, use of sufficient chaplets should overcome that problem.

Use of water around a pouring floor is rather hazardous since some of it will be in other than the place desired, and water and molten metal do not mix very well. If water cooling is to be used, the area should be away from where regular operations are conducted so that proper attention can be given to any leakages. It is essential that connections of the coil to the water supply and exit should be tight, and should be tested beforehand to make sure. Water should be turned on just before the metal is poured in and allowed to flow through the coil until the metal has solidified. If the water is turned on for any length of time before pouring, moisture from the sand in the mold may condense on the coil and cause blows.

Lack of Vent Causes Blowing

We are trying to make some gas range burners. We do not have much experience with that operation and have continual trouble with the castings blowing along the top of the core. We use sand with a 50 AFS grain fineness, and have tried core oil ratios from 1:60 to 1:160. There are no prints on the core; a flat surface on both the large ring end and the small valve end resting on the drag surface of the mold. Core is held down with perforated chaplets. Metal thickness is 3/16 in.

Apparently your difficulty arises from the inability of the gases generated by contact of the molten iron with the core to escape, and that will have to be corrected to insure successful castings. The sand you are using is sufficiently open, and even with the low ratio of 1 part oil to 60 parts sand by weight, the amount of oil would not be too excessive although for economical reasons it is preferable to use the least quantity which will permit handling the cores.

Most burner cores have a print at the air port or valve end as you call it, and a vent through that up the tube as far as possible. Vent is formed with a small wire. From your description we gather that the port for the entrance of air into the burner is at the top of the enlarged or valve section, and is formed by the flat section you mention.

It seems to us that since a hole must be drilled in the end of the burner in the air port or valve section for entrance of the end of the gas valve, you could form that hole with an extension of the core, and thus permit the use of a vent through that as mentioned earlier.

Possibly by use of the vent wire through the drag mold in the areas of the flat sections of the core the trouble from blowing might be overcome. Additionally, scratch vents on the bottom face of the drag from the wire vented portions to the outside edge of the flask will be needed to permit easy escape of the gases.

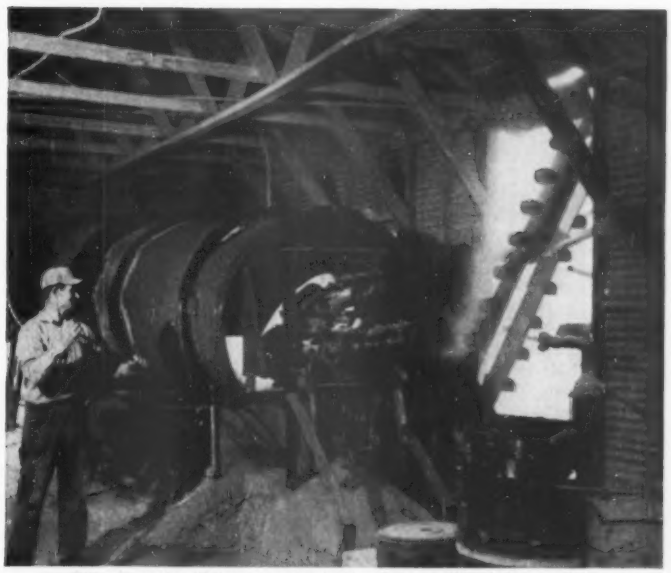
Molding Sand Lacks Strength

As a hobby I am making aluminum nameplates, and now am having difficulty with the sand which does not seem strong enough. Where I formerly lived I obtained sand from an aluminum foundry, but presently live too far away to get it. So I purchased some sand from a supply house, mixed it with clay in the ratio of 1 clay to 5 sand, approximately 1 per cent wood flour, and 4¼ to 5 per cent water by guess. Since I do not have a vibrator, I use quite a bit of parting powder which leaves the castings rough. Do you think I used too much clay? What are your suggestions?

Presumably your reference to the addition of clay to the sand means that the latter is clay-free or contains only a small amount of bond. Since clay weighs slightly less than sand, the mixture of one part clay to five parts sand either by volume or weight would result in a clay content of around 16 per cent. While that might be somewhat high we do not believe it is the cause of your trouble, provided the moisture content is sufficient. In your case the moisture is too low since the content for clay bonded sands is in the range of 6 to 8 per cent.

One other possibility is that you are mixing by guess, and the figures you mention may not even be close. It will be necessary to measure the ingredients by weight or by volume so that you will know definitely how much of each is being used. We believe that you probably can bring your sand up to strength by adding more water in small amounts, mixing well, and testing its strength by whatever method you are using. Also we believe that when your sand is up to the proper "temper" you will not need any parting powder. By careful rapping of the pattern you should be able to withdraw it from the sand. We doubt that the addition of wood flour is necessary in sand for aluminum since the temperature reached does not cause trouble from sand expansion.

HOT MATERIALS ELEVATOR BELT



Silica heated to 450 degrees F being loaded onto "U.S." Elevator belt.

"U.S." Elevator belt carrying hot silica up to and discharging it into chute.

"Terrific heat, terrific weight, high abrasion . . . all combine to severely tax elevator belts. But this U.S. Rubber Belt has been on the job 3 times longer than any belt previously used," says co-owner J. C. Barry of Barry & Barry Sand Co. (Silsbee, Texas) producers of foundry, chemical and specialized sands.

J. C. and J. W. Barry watch the hot silica being funneled into loader equipped with "U.S." loader belt.

"We have two U.S. Rubber elevator belts here," he adds. "We need belts that will last a long time, which means belts that are not bothered by terrific heat (up to 450 degrees F.) terrific weight, plus the abrasive action of sand. So far, each of these belts has outlasted the belts of other makes while showing no signs of wear. *These belts never fail us...no lost production, no downtime.* We are very satisfied. They do our job best."*

It is performance such as this that has made U. S. Rubber the largest manufacturer of conveyor and elevator belts.

• • •

When you think of rubber, think of your "U. S." Distributor. He's your best on-the-spot source of technical aid, quick delivery and quality industrial rubber products.

*This installation was handled by "U. S." Distributor Behring, Inc., Beaumont, Texas.

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Circle 610 on Page 53

LET'S LOOK at

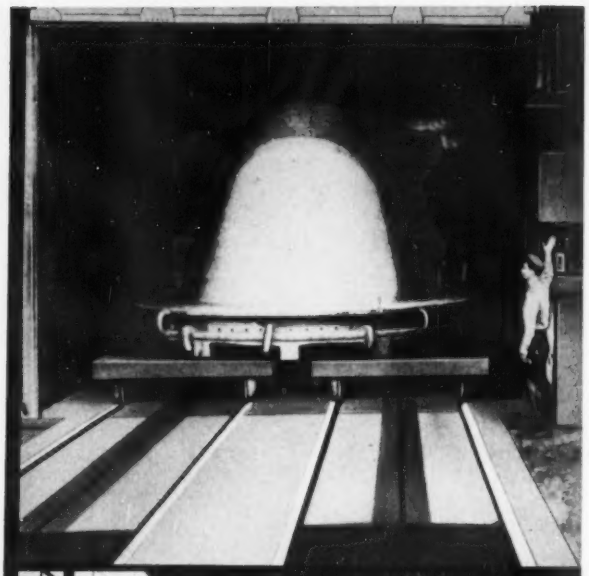
OVENS for every baking requirement

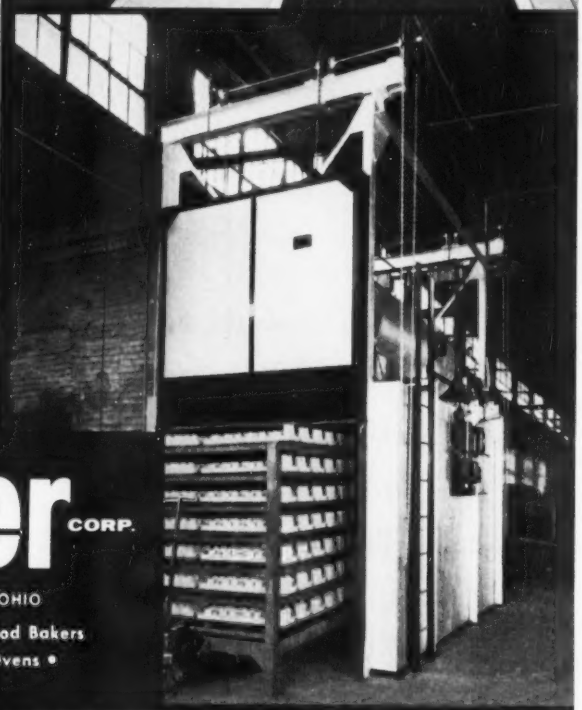
OVENS that will be faster and less expensive to operate

OVENS that are designed to best fit your operation

Carl Mayer designs and manufactures all types of ovens as well as "specials" to meet unusual operating conditions. Most incorporate the Carl Mayer recirculating heating system with sealed combustion chamber that keeps gases from prematurely escaping into the load area. Cores and molds are baked evenly with no burning. Temperatures are always under control.

Write for Bulletin 53-CM





TOP RIGHT—This large car type mold oven is installed at Pittsburgh Steel Foundry. Its special triple slotted panel construction reduces heat loss 1/3. Fuel savings up to 50% over old conventional methods are possible. Drying time is often cut in half and temperatures are uniformly controlled.

MIDDLE RIGHT—This rack type core baking oven is at the Fremont Foundry Co., Fremont, Ohio. It is equipped with a recirculating combination gas-oil fired heating system.

BOTTOM RIGHT—Vertical Core Oven (unloading position) at A. C. Williams Company, Ravenna, Ohio. This oven is 11'-0" wide x 11'-0" deep x 45'-0" high.

BELOW—Our standard rolling drawer type core baking oven. The heating equipment (not shown) may be mounted on floor beside unit or on the roof. Particularly adaptable to brass and aluminum foundries.

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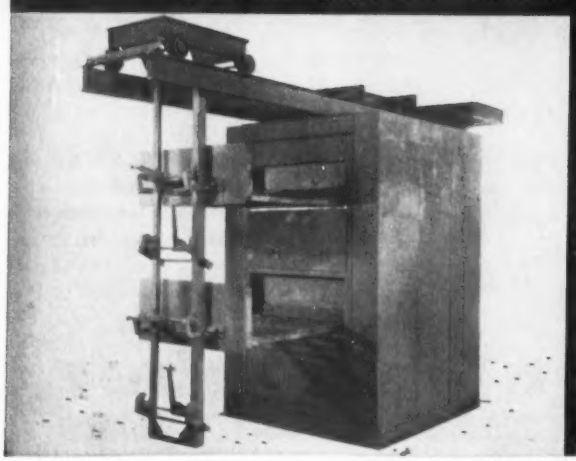
OTHER PRODUCTS: Heat Treating Ovens and Furnaces • Rod Bakers • Welding Rod Ovens • Paint and Ceramic Drying Ovens • Special Processing Equipment and Accessories



For More Information
Use Reply Card—Page 53

What's New in Equipment and Supplies

PORTABLE FINISHING BARREL

Model DBM-10 Super Mite portable deburring and finishing barrel is intended especially for use in plants and departments processing

small lots of parts. The 12-in.-diam x 8-in.-wide barrel has a ½-cu-ft capacity and is equipped with a quick-acting camtype door. It is driven at variable speeds from 19 to 38 rpm by a 1/6-hp, 110-v motor. Machine is equipped with a start-stop switch.—**Almco, Queen Products Div., King-Seeley Corp.**, Albert Lea, Minn.

For More Details Circle No. 450—Page 53

EPOXY LAMINATING RESIN

Epoxy laminating resin Epocast 28, in conjunction with hardener 9012, forms a structural resin that displays good thermal stability and uniform dielectric properties over a broad range of temperatures. It is said to be an excellent casting resin. Features include a relatively short cure at moderate temperatures and good electrical properties.—**Furane Plastics Inc.**, 4516 Brazil St., Los Angeles, 39, Calif.

For More Details Circle No. 451—Page 53

VIBRATION INDUCER

Redesigned vibration inducer BD-10 weighs 4½ oz. It is fitted with a replaceable jet for greater air economy. Vibration is generated by a rolling ball driven in an orbit on replaceable raceways of hardened high alloy steel precision ground. Special lug allows mounting in any position with a single bolt. Vibrator will handle bins with 4 cu ft storage capacity. Air consumption is 3 cfm (free air at 80 psi). It will operate on as little as 5 psi.—**Martin Engineering Co.**, Neponset, Ill.

For More Details Circle No. 452—Page 53

CASTABLE REFRACTORY

Castable refractory K-L mix is recommended for a wide range of general applications. It has exceptional strength that develops early and runs uniformly through its broad temperature range—200 to 3000° F. To place 1 cu ft requires 125 lb; it is packed dry in 100-lb bags. Mixed with water, it can be poured or trowelled, and it sets hydraulically.—**Plibrico Co.**, 1800 N. Kingsbury St., Chicago 14, Ill.

For More Details Circle No. 453—Page 53

AIR-OPERATED HOISTS

Series 700 Load Lifter air hoists are designed for heavy-duty service. This line of cable type hoists includes sizes for nearly every lifting need from 1 to 15 tons capacity, with choice of lifts and suspensions. Features include variable lifting speeds, one-hand pendant control cord, compact design, positive acting load brake, and five-cylinder, radial, piston-type air motor with overlap of power impulses for even torque at all speeds. Standard suspensions are lug type, push type trolley, and hand-geared trolley.—**Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore Inc.**, Muskegon, Mich.

For More Details Circle No. 454—Page 53

PARTING COMPOUND

Partall parting compound is polyvinyl alcohol that will not bridge in corners. It is said to provide an excellent separating medium where polyester and epoxy resins are used.—**Plaster Supply House**, Box No. 551, Chicago 90, Ill.

For More Details Circle No. 455—Page 53

HYDRAULIC DUMPER

Hydro-Dumper is designed to handle the latest type bulk material containers. Load capacity is up to 3 tons. Dumping heights are up to 4 ft on floor-level installation.

Mobile units are mounted on four heavy-duty, ball bearing casters. Two positive-acting floor locks hold the dumper in position while loading or dumping. Dumpers are hydraulically operated by lever or pushbuttons and are easily loaded by hand or fork truck.—**Essex Conveyors Inc.**, 165 Franklin Ave., Nutley 10, N. J.

For More Details Circle No. 456—Page 53

SAFETY GLASSES

Eyeshade Spec shades eyes from overhead glare while protecting from impact with a one-piece optical plastic lens. The nose piece is self-adjusting. Regular lenses and sideshield lenses are furnished in clear or medium green.—**U. S. Safety Service Co.**, 1535 Walnut St., Kansas City 8, Mo.

For More Details Circle No. 457—Page 53

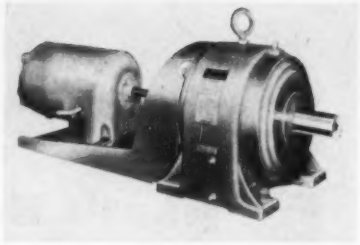
FIRE EXTINGUISHERS

Hand portable dry chemical fire extinguishers are based on the stored pressure principle. Features of the Sentry include one-hand operation, an indicating gage in color, and interchangeable heads. Since the hose is positioned to extend upward, the unit can be mounted on narrow structural beams with little or no overhang. Extinguishers are available in 10, 20, and 30-lb dry chemical capacities and in red or white.—**Ansul Chemical Co.**, Marinette, Wis.

For More Details Circle No. 458—Page 53

GEAR REDUCER COMBINATION

Combined gear reducer and gearsift drive unit is designed for those applications where more than one speed on the output shaft of the gear reducer is desirable. This unit



offers four or eight speeds. Double and triple units are available. Motor capacities are rated from 1 to 10 hp. By moving the shift lever on the gearshift drive into one of four positions, four different output shaft rpm are obtainable.—**Lima Electric Motor Co.**, subsidiary of Consolidated Diesel Electric Corp., Dept. 156, Lima, Ohio.

For More Details Circle No. 459—Page 53

INVESTMENT MOLD FURNACE

Model No. SM1818 furnace is designed for firing shell investment molds. It is constructed of sheet steel shell with angle iron legs and frame. Heat chamber top and trap doors are lined with 2300° F insulating fire brick—4½ in. thick on walls and top, 2½ in. thick on all doors. Features include gas-fired atmospheric burners with indicating pyrometer, 1800° F temperature, alloy grid hearth, trap-door bottom, water filled pan to collect molten wax, and counterweights on all doors for easy operation. Dimensions are 36 x 41 x 72 in.—**Alexander Saunders & Co.**, 95 Bedford St., New York 14, N. Y.

For More Details Circle No. 460—Page 53

CORROSION INHIBITOR

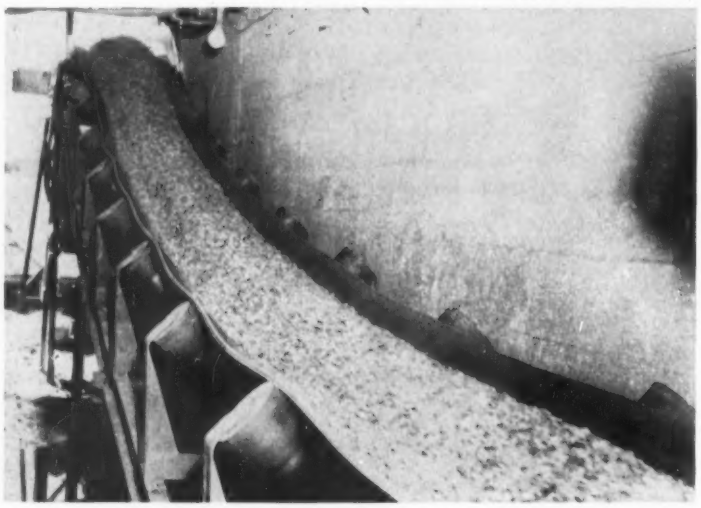
Water soluble corrosion inhibitor for ferrous metals is said to provide 100 per cent protection against corrosion hazards in aqueous systems. When mixed with water, it forms a clear, colorless, odorless, non-irritating, and non-foaming solution which is not subject to rancidity or bacterial decomposition.—**Rust-Lick Inc.**, 755 Boylston St., Boston 16, Mass.

For More Details Circle No. 461—Page 53

EXTERNAL VIBRATOR

Tremix external vibrator is a totally enclosed, self-contained unit ready for permanent or portable attachment to the object needing vibration. Unit has a very high impact-energy to weight ratio, and it can be mounted in any position. It

Belt for 45-Degree Idlers Hauls Bigger Loads



Ray-Man conveyor belt for use with 45-degree troughing idlers carries up to 60 per cent more dry silica sand and 12 per cent more tempered sand. It is guaranteed for the life of the belt against ply or cover separation at the idler hinge line when used with idlers set at any angle up to 45 degrees.

Initial cost is lower because narrower belts haul the same loads as belts on 20-degree idlers. Reduced spillage cuts maintenance costs, operation is cleaner and safer, and less downtime is necessary. Narrower belts also occupy less space.

The belt is doubly compensated so that the outer ply stretches as the inner ply contracts under both lateral and longitudinal flexing and on reverse bends. Outer strength plies are made with a high-strength synthetic fabric of controlled elasticity which relieves stress on the belt as it travels over idlers and terminal pulleys.—**Manhattan Rubber Div., Raybestos-Manhattan Inc.**, Passaic, N. J.

For More Details Circle No. 493—Page 53

Photograph courtesy of Soo Foundry, Sault St. Marie, Ontario

Attention, Jobbing Foundries!

Soo Foundry and Machine Co., Ltd., 457 Bay St., Sault St. Marie, Ontario, increased production, decreased costs and improved casting finish by installing a 'Major' Sandrammer. This enabled them to bid for and get orders out of their range before. 'Major' is complete with storage bin and loader. 18" diameter head gives 600-800 lb. sand per minute. Power assistance means more work, less operator fatigue. Low installation cost; no pit required. Patents granted or pending in U. S., Canada, Great Britain and other industrial countries.

Increase your production with present labor force and small capital outlay. We have a 'Major' package deal to suit YOU. For full information, write to:

Circle 612 on Page 53

FE FOR FOUNDRY EFFICIENCY

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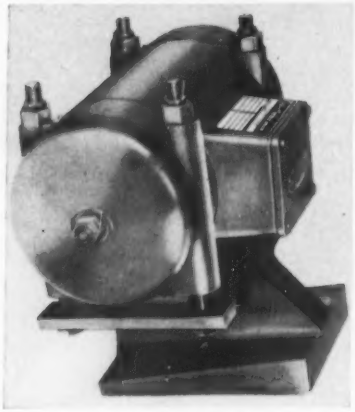


comes in three models, weighing 30, 40, and 60 lb, with impacts ranging from 500 to 1400 lb. Each delivers 3600 vibrations per minute and operates on ac current.—**B. W. Elliot Mfg. Co.**, Binghamton, N. Y.

For More Details Circle No. 462—Page 53

MAGNET CHAIN ASSEMBLIES

Accoloy No. 125 magnet chain assemblies have been designed to accommodate electrically - energized magnets of all sizes and lifting capacities. Tripod construction prevents chain damage due to twisting. All legs are replaceable in the field, being connected to the master alloy casting with square-end pins. These pins prevent rotation.

Units are available in 1 and 1¼-in. chain assembly sizes. The 1-in. component accommodates magnets of less than 60-in. diam and the 1¼-in. unit is designed for magnets 60-in. diam and larger. Both assemblies possess a 7 x 12 in. erect master link that will work with all standard crane hooks. — **American Chain Div., American Chain & Cable Co.**, York, Pa.

For More Details Circle No. 463—Page 53

DRUM HANDLER

Grip-O-Matic is designed to pick up every type of drum, whether new or battered, with closed or open tops, one or two at a time. The gripping head consists of two hardened jaws which grip the bead. No springs are used, and the unit can be adjusted to various heights. Drums are released only when they are set down.

This handler can be mounted on the truck carriage or slipped on the forks or over the lip of a shovel, for either constant or intermittent drum handling.—**Little Giant Products Inc.**, 1562 N. E. Adams St., Peoria, Ill.

For More Details Circle No. 464—Page 53

AIR SAMPLING KIT

Portable kit for dust and gas sampling combines a vacuum pump, flowmeter, and weather-proof housing. Vacuum pump is a carbon-ringed piston unit which never requires lubrication. A choice of 2 or 4 cfm air capacity is available. The flow indicating device is a tapered orifice plastic meter. Unit measures 18 x 11 x 10 in.—**Gelman Instrument Co.**, Box 86, Chelsea, Mich.

For More Details Circle No. 465—Page 53

SAND SURFACE TESTER

Sand specific surface tester operates on an air permeability method. The instrument is used to determine the area of the surfaces of a sand sample in terms of square centimeters per gram of sand. A comparison of specific surface of a normal sand with that of spheres of equivalent size offers a method for expressing the relative angularity of sand grains. The specific surface test enables the operator to estimate liquid binder requirements quickly for new, unknown sands.—**Harry W. Dietert Co.**, 9330 Roselawn Ave., Detroit 4, Mich.

For More Details Circle No. 466—Page 53

AIR LINE COMBINATION

Air line filter - oiler - regulator filters air, removes moisture, supplies an oil mist, and regulates air pressure to desired value. Filter can handle capacities up to 7 cfm. It is equipped with a 40-mu filter element. A needle valve shut-off is provided on top of the filter. Oiler functions automatically, furnishing an oil mist proportional to air used. Delivery can be regulated on the bottom of the oiler. Regulator will reduce air pressure to any selected valve and automatically retain this secondary pressure.

Pressure gage registers from 0 to 160 psi and can be used on maximum air pressures of 150 psi and maximum temperatures of 150° F. All components can be purchased separately if desired. — **Oil-Rite Corp.**, 2387 Waldo Blvd., Manitowoc, Wis.

For More Details Circle No. 467—Page 53

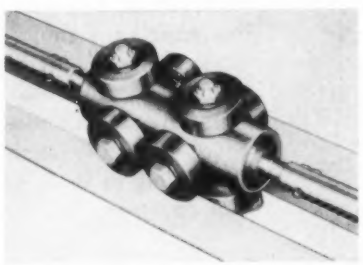
NONSKID COMPOUND

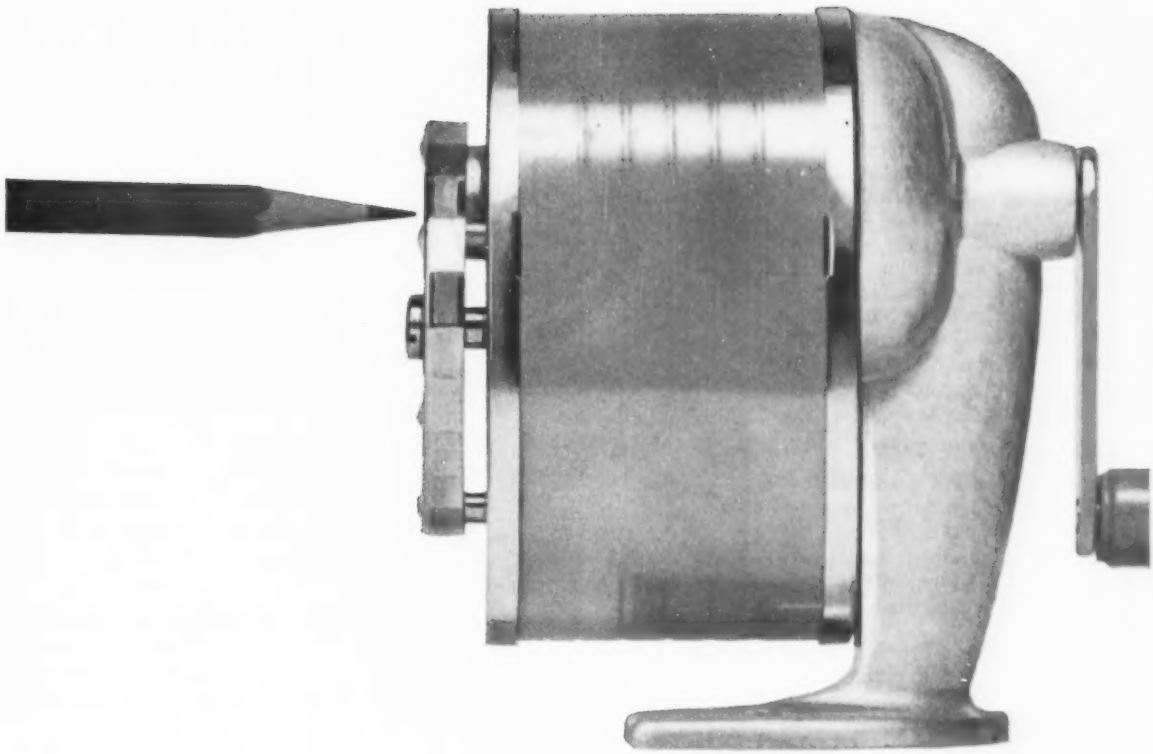
M-S-A Dura-Grip is a nonskid compound for safety underfoot. The grit-impregnated bonding resin can be used on concrete, wood, or metal. Its light consistency permits rapid application. When fully cured, the compound resists grease, oil, and most common solvents. The material is available in four colors and in 2-qt and 2-gal kits.—**Mine Safety Appliances Co.**, 201 N. Braddock Ave., Pittsburgh 8, Pa.

For More Details Circle No. 468—Page 53

CHAINLESS CONVEYOR

One standard trolley housing for all capacities enables the user to convert an existing chainless conveyor from 100 to 400-lb capacity by changing the wheels. Either light or heavy duty wheels can be used. The eight-wheeled trolleys are connected by steel rods terminating in ball and socket joints. Line pull is directed through the centerline of the trolley.





to make our point quickly

Take your pencil and check off *why* you should make your castings with Penolyn Core Oil. First, you are assured maximum foundry efficiency. Second, you'll find there is a grade of Penolyn Core Oil to meet the most exacting requirements of every Foundry and Core Room practice. Third, and most important —

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9. Minimum gas
10. Ample collapsibility

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Circle 613 on Page 53

(Advertisement)

How American Brake Shoe Maximates Production

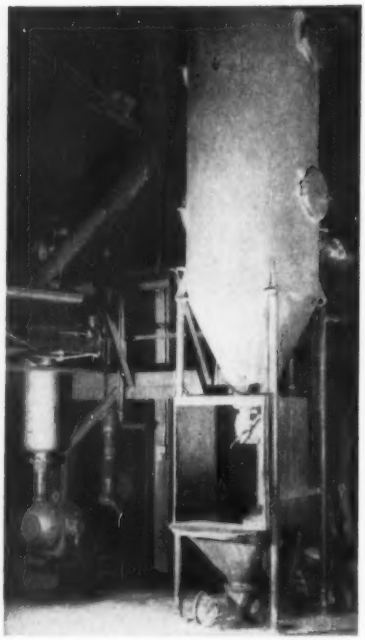
When the American Brake Shoe Company began an extensive modernization program at its New Castle, Delaware plant, one of the first steps management took to maximate production—that is achieve maximum output at less cost—was to install a Hoffman pneumatic conveying system for keeping bentonite, dextrin, silica flour and other materials *on the flow.* With a Hoffman exhauster furnishing the air as well as suction for the handling system, and use of components described here, the equipment not only simplified bulk conveying chores but paid its way in a few months by providing substantial production, material and labor savings.

MATERIAL INTAKE VALVE

Materials are introduced into the air stream through a unique nonclogging intake valve attached to the bottom of a hopper and flow smoothly through pipe lines to any one of six primary cyclone storage tanks more than 350′ distant. Hoffman intake valves insure the uninterrupted flow of dry, powdery or granular materials through all types of vacuum conveying systems. Suitable for use with 2″ through 6″ pipelines, they are equipped with standard 8″ flanges and can be easily attached to bins, hoppers, or dust collectors. Connected equipment is protected from exposure to the full suction of the system by a separate air inlet. The material handling rate can be adjusted while air is flowing. Thorough mixing insures smooth transit.

HINGE VALVE

Self-cleaning Hoffman hinge-type discharge valves are designed for air-tight closure against a head of material. The one-piece valve body is cast of gray iron with its rubber-faced disc and seat completely inside the casing. Lever linkage permits operation by means of chain or cable from a remote station. Provision can also be made for air or hydraulic cylinder actuation of the valve.



A portion of the Hoffco-Veyor system installed at the American Brake Shoe Co. plant in New Castle, Delaware.

ROTARY VALVE

Chain driven rotary discharge valves of cast semi-steel construction feed the material in controlled quantities. Designed for interchangeability of various types of fabricated and cast rotors, valves are equipped with torque limiting drive sprockets for protection against jamming and overloading. Equalizing connections permit attachment of bleed lines to vacuum or pressure source. Inspection of the interior can be made through an access port without disassembly of the valve.

PERISTALTIC VALVE

Controlled expansion and contraction of rubber diaphragms permit discharge in measured quantities. Since there are no internal moving parts, even coarse abrasives can be handled with minimum wear. Sheet rubber diaphragms are easily replaced whenever necessary.

COMPETITIVE ADVANTAGES

In handling quantities of dry, free-flowing powdery and granular materials such as sand, shot, chemicals, etc., Hoffco-veyor systems and components speed production—provide many genuine benefits and advantages which are reflected in higher profit margins. These include:

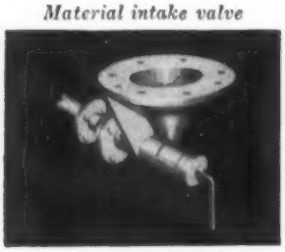
- flexibility
- cleanliness
- time saving
- lower initial cost
- easy installation
- material saving
- labor saving
- pay for themselves

FREE ENGINEERING SERVICE

If you have a materials handling problem, you can solve it with either a complete Hoffman system or any of its parts which may be purchased separately to fit your needs. Available equipment includes dependable centrifugal blowers/exhausters, cyclones, collectors, material intake, hinge, rotary, butterfly and peristaltic valves as well as filter bag collectors. We'll be glad to make a free engineering survey to determine how you can improve your manufacturing methods by maximating production with a really tight method of material handling. Send now for a free descriptive booklet. Please write:

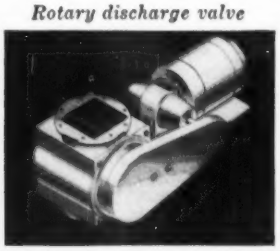
Air Appliance Division
Dept. EM
U. S. Hoffman Machinery Corp.
103 Fourth Avenue
New York 3, New York

Material intake valve

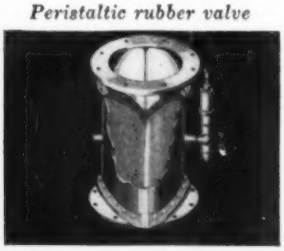


Hinge valve

Rotary discharge valve



Peristaltic rubber valve



This construction suits the conveyor for installations such as overhead or subfloor tow types—inverted for use with pans or pallets—pusher systems, and conventional overhead applications. — **Conveyor Div., American MonoRail Co.,** Fourth and Franklin Streets, Tipp City, Ohio.

For More Details Circle No. 469—Page 53

INSULATING FIREBRICK

B&W K-20 and K-23 insulating firebrick are lightweight and low in thermal conductivity. The material can be fitted with hangers or pins without danger of breakage. It is claimed to have better mortar bonding and resistance to gas erosion and can be cut, drilled, or shaped as necessary.—**Babcock & Wilcox,** 161 E. 42nd St., New York 17, N. Y.

For More Details Circle No. 470—Page 53

LENS CLEANING STATION

All-metal, heavy-duty lens cleaning station is suitable where dust, grime, and grease are a problem. Station contains box of giant size No Fog lens cleaning tissues and a specially designed bottle incorporating an easy-action spray pump. Tissues are chemically treated and can be used several times.—**Carhoff Co.,** 11706 Kinsman Rd., Cleveland, Ohio.

For More Details Circle No. 471—Page 53

LUBRICANT

Dag 207 is a new lubricant formulated for use at high temperatures. The material is a concentrated dispersion of colloidal molybdenum disulfide in an LB series Ucon lubricant. It resists settling and lubricates at temperatures above the point at which many other materials carbonize.—**Acheson Colloids Co.,** 1635 Washington St., Port Huron, Mich.

For More Details Circle No. 472—Page 53

PORTABLE BUCKET ELEVATOR

Portable bucket elevator is designed to handle granular materials up to a 12-ft height. Features include electric motor drive, steel buckets bolted to belt, delivery chute, hopper, and casters to suit each application. It is available in any height from 6 to 12 ft.—**New London Engineering Co.,** New London, Wis.

For More Details Circle No. 473—Page 53

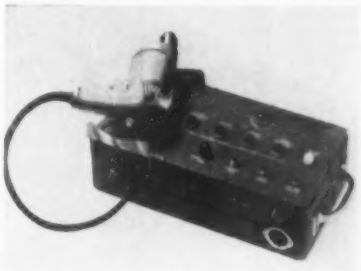
DUAL MOTOR VIBRATOR

Model RC-31 dual motor vibrator is geared for synchronous action. It operates on a rotating eccentric weight principle and features adjustable eccentrics, permitting force of vibration to be varied without changing weights. Variable impact range is from 640 to 2200 lb. It is claimed to prevent sticking, arcing, or bridging.—**Cleveland Vibrator Co.,** Cleveland, Ohio.

For More Details Circle No. 474—Page 53

TOOL TESTER

Model B-100 electrical tool and appliance tester can prevent and eliminate the use of defective apparatus, avoiding danger to life and equipment. It can program and test ac portable electrical tools, fractional-hp motors, and other small electrical items within its ratings. This compact portable tester operates from 110 to 120 volts ac 60 cycles.—**Pow-R-Safe Inc.,** 308 Main St., East Orange, N. J.



For More Details Circle No. 475—Page 53

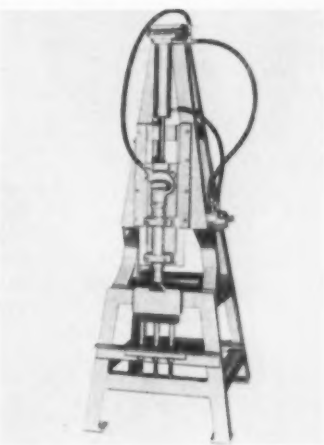
AUTOMATIC PROGRAMMER

Programming - controlling - indicating-recording instrument simultaneously reads a pencil-drawn program chart, controls a process accordingly, and superimposes a record of process performance on the same chart. This Prekorder system is usable wherever conventional chart recorders are used. It is adaptable to any process which may

Knocks Cores out of Metal Castings

Core knockout machine made with an air-operated hammer is particularly suited for light metal castings. It is said to work equally well on all types of cores, including CO_2 and baked types, and also is said to clean off molding sand rapidly.

An air piston traverses the head and provides positive gripping, usually on the sprue of the casting. Designed for connection to the shop air line, the unit has a lever-operated valve to control the head traverse. Shakeout is controlled by the trigger on the hammer. The anvil is supported on a spring mount in the base portion of the fabricated frame. Can be installed at various points for easy, convenient shakeout.



—**United States Drill Head Co.,** 616 Burns St., Cincinnati, Ohio.

For More Details Circle No. 494—Page 53

At Speakman Company...

OSBORN 716-

with automatic controls molds cope and drag simultaneously ...and in half the time

Osborn 716-PVA Automatic Vibrating Squeeze Pin Lift Molding Machine frees operator to set cores during machine molding cycle

Using the Osborn 716-PVA, a wide range of molds now produced with matchplate patterns can be made with even greater economy. Field reports show one man and the 716-PVA produce approximately twice as many molds per hour. The reports also show better quality finish on castings and less scrap. Operators also prefer the 716-PVA molding procedure because less manual effort is required. Here's why:

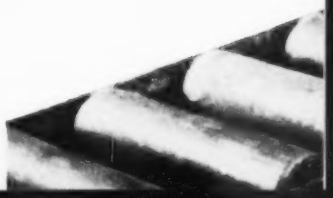
To simplify simultaneous cope and drag molding, the operator pushes a button, initiating the automatic molding cycle. During the cycle, in which both a cope and drag are produced at one time, the operator sets cores in a previously made drag.

As the 716-PVA completes its cycle, the cope and drag halves are stripped automatically and remain at rest on the lifting frame. The operator picks off the cope, places it over the cored drag of the previous cycle. After pushing the complete mold onto the conveyor, the operator removes the next drag from the PVA machine. Flasks are placed on the machine, the flasks are filled with sand and the next automatic molding cycle initiated.

A study of your operations could show savings like these in your molding department. Call *The Osborn Manufacturing Company, 5401 Hamilton Ave., Cleveland 14, Ohio.*

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION MEMBER FEMA

AT SPEAKMAN COMPANY, WILMINGTON, DELAWARE, *quality molds for brass plumbing fixtures are produced efficiently on preset time cycles with Osborn's automatic controlled 716-PVA Vibrating Squeeze Pin Lift Molding Machines.*



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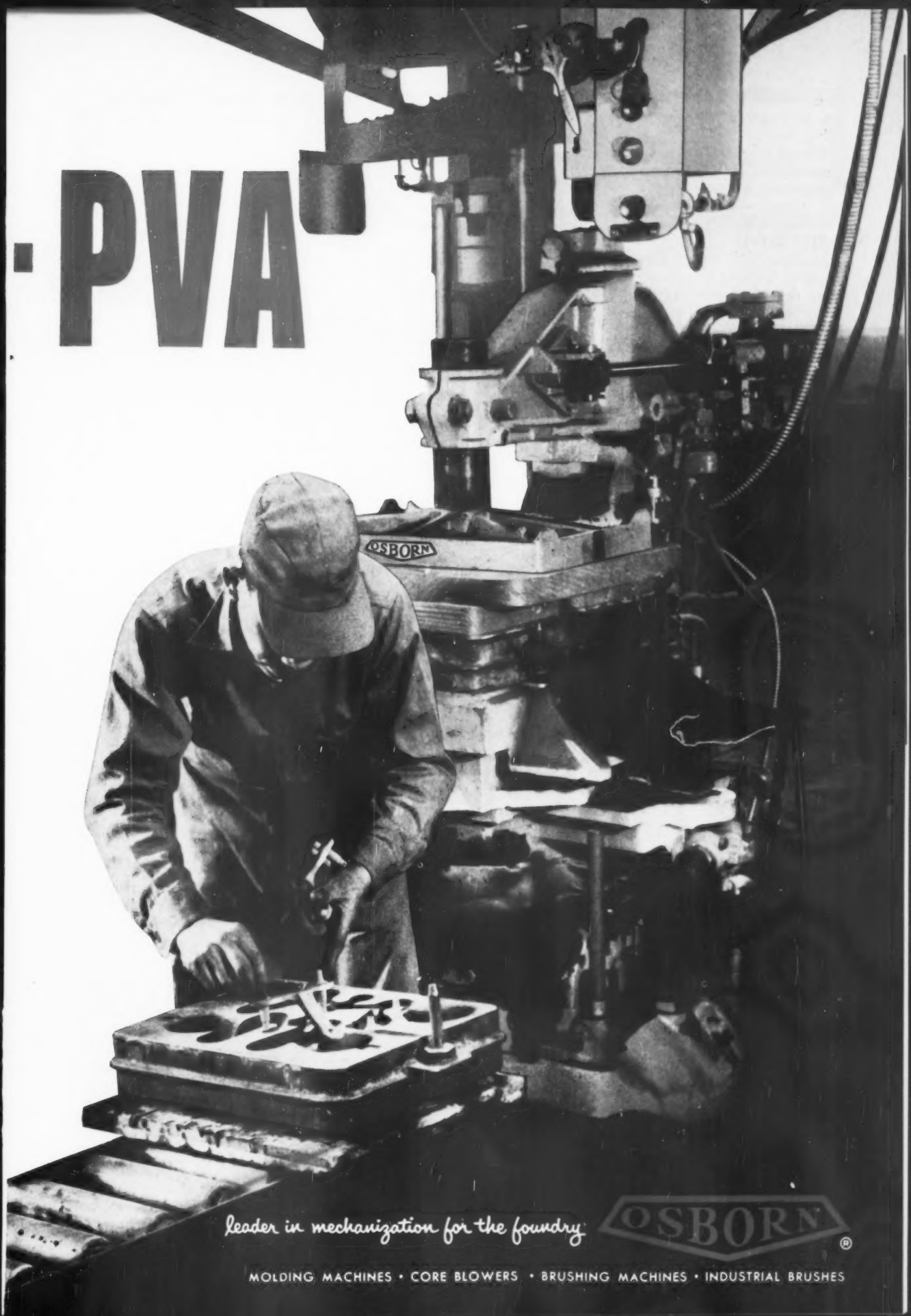


leader in mechanization for the foundry

OSBORN®

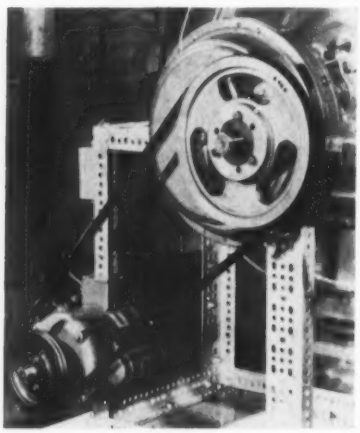
MOLDING MACHINES • CORE BLOWERS • BRUSHING MACHINES • INDUSTRIAL BRUSHES

be electrically controlled and which can be monitored by a transducer either mechanically or electrically connected to the recording pen.—**Research Inc.**, 115 N. Buchanan St., Hopkins, Minn.

For More Details Circle No. 476—Page 53

V-BELT DRIVES

American 3-5-8 V-belt drives use improved belts with cross-sectional areas reduced nearly 50 per cent.



They reportedly can transmit up to three times as much power in the same area; or fewer belts, narrower sheaves, and smaller center distances can be used to transmit the same amount of power. Each of the three belt cross sections has been fitted to a particular horsepower range. 3-V belts (3/8-in. top width) handle drives from 1 to 50 hp; 5-V belts (5/8-in. top width) handle drives up to 200 hp; and 8-V belts (1-in. top width) transmit up to 1500 hp.—**American Pulley Co.**, Philadelphia, Pa.

For More Details Circle No. 477—Page 53

TUBULAR FURNACE

Model 59-TA tubular furnace is designed for tensile and creep testing of metals and alloys within a high vacuum at temperatures up to 4000° F. Measuring about 44 in. in over-all height and 11 in. in OD, the furnace operates on approximately 14 v, 1600 amp, in conjunction with special transforming equipment. Maximum input to the heating element is 25 kw. Specimen is assembled with tension rods, then lowered through the vacuum chamber from the top.—**Marshall Products Co.**, 270 W. Lane Ave., Columbus 2, Ohio.

For More Details Circle No. 478—Page 53

ELBOW FANS

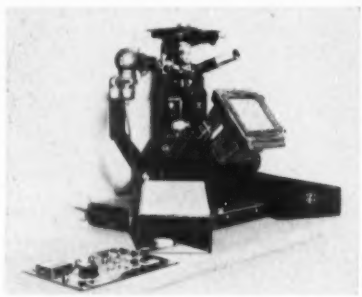
Wingflow elbow fans for general ventilation are available in five basic sizes for capacities from 600 to 32,000 cfm at static pressures to 2 in. or more. Standard fans can handle up to 750° F. Special construction is said to accommodate corrosive or explosive conditions. A choice of three inlet connections is provided.

Dynamically-balanced fan wheels have airfoil blade profiles for high efficiency with minimum turbulence, vibration, and noise. Flat horsepower characteristics prevent motor overload. An adjustable-pitch V-belt drive permits field adjustment of capacity to suit actual or changed conditions.—**L. J. Wing Mfg. Co.**, Linden, N. J.

For More Details Circle No. 479—Page 53

METALLOGRAPH

Precision metallograph meets all standard requirements. It was designed particularly for the laboratory operating on a restricted budget, but it is said to have unlimited versatility. Features include



a built-in camera with a 4 x 5 in. projection screen. Images and photomicrographs are produced of all magnifications within the range of 32 to 2200 X. All components and accessories are interchangeable. —**William J. Hacker & Co.**, P. O. Box 646, West Caldwell, N. J.

For More Details Circle No. 480—Page 53

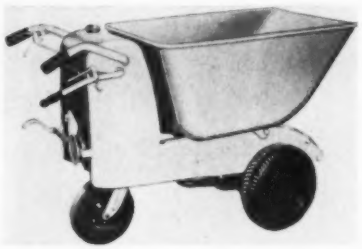
TRUCK BATTERY CHARGER

Portapak battery charger is designed for charging motorized hand rider-type lift truck batteries. Charging is completely automatic. Unit charges lead-acid batteries in 8 hr or less, and nickel-alkaline batteries in 7 hr. It is available in generator capacities of from 3 to 15 kw. —**Motor Generator Corp.**, West Water Street, Troy, Ohio.

For More Details Circle No. 481—Page 53

POWERED WHEELBARROW

Combination transmission, differential, and drive axle assembly of



model M-15B powered wheelbarrow is completely enclosed in one housing and lubricated from one oil reservoir. The transmission is full torque shifting, constant mesh, with instant shift from forward to reverse. Wheelbarrow has 3/4-ton capacity. The 10-cu-ft dump bucket latches onto the chassis and is quickly interchangeable with a flatbed platform. Powered with a 7-hp, air-cooled Wisconsin engine, the wheelbarrow is 31½ in. wide and 65½ in. long.—**Prime-Mover Co.**, Muscatine, Iowa.

For More Details Circle No. 482—Page 53

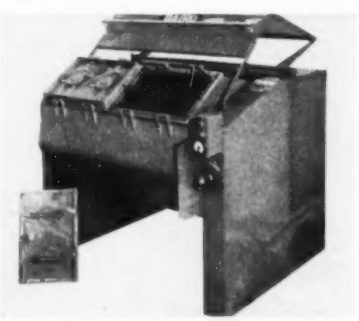
PLASTIC WELDING HELMETS

Standard size Fiberglas reinforced plastic welding helmet has a straight front to provide maximum ventilation and more chest protection. Model 1210 is one piece molded with fixed lens holder molded into the shell to eliminate possibility of light leaks. Model 1211 has a lift-front lens holder.—**Hobart Brothers Co.**, Troy, Ohio.

For More Details Circle No. 483—Page 53

FINISHING MACHINE

Horizontal barrel finishing machine requires only 5 sq ft of floor space. Because the Finishmaster is



less than 4 ft high, all loading and unloading equipment can be carried over the top of the machine. Controls are at the front of the unit so that machines can be placed

PROVEN PRODUCTS FOR THE FOUNDRY INDUSTRY

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Sand Conditioners;
Phenolic Shell Molding Resins;
Phenolic, Amino and
Alkyd Core Binders

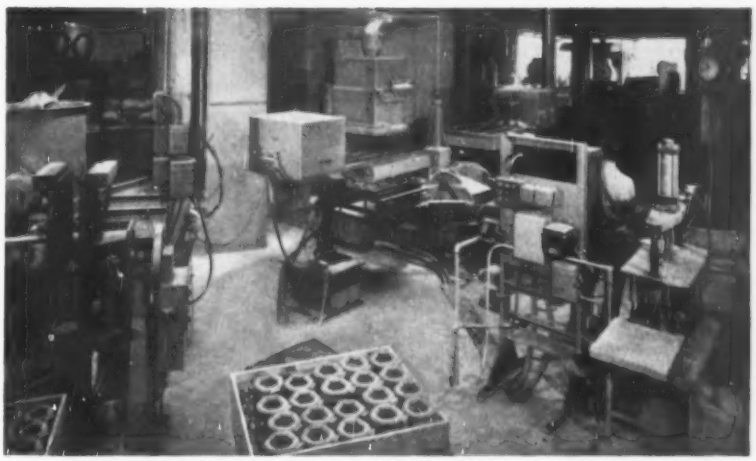
When close tolerances are vital

RCI FOUNDREZ INSURES ACCURACY IN HICA SHELL MOLDING PROCESS

Shreveport, La. —HICA, Inc., reports that shell molds made with Reichhold's Foundrez 7504 powdered phenolic resin produce "High Integrity CAstings" for manufacturers of chemical and milk processing equipment, aircraft, missile, pump, valve and burner parts. HICA pours stainless and other alloys on intricate jobs requiring extremely close tolerances.

HIGHEST DEPENDABILITY

In a recent interview Phillip R. Johnson, HICA shell molding foreman, said "The dependability of RCI's Foundrez recently helped us supply a large order of complicated castings without a single reject by our customer. With Foundrez, we are able to avoid the warpage and cracking frequently encountered with other resins. Nor have we experienced any problem that could be attributed to our use of Foundrez."



HICA'S *shell molding department. Up-to-date methods and machines help produce accurate, economical castings.*

HICA *team ready to close cope and drag halves of plug valve handle adapter mold after cores have been set in place.*

ECONOMY IMPORTANT

Besides dependability and quality, economy played a significant part in HICA'S choice of Foundrez. "The superior bonding qualities of RCI's Foundrez 7504," said Mr. Johnson, "allow us to use less resin per pound of sand, affording us substantial savings in our production run. It's easy to see why we use Foundrez exclusively in all our shell molding techniques."

VARIETY OF RESINS

Reichhold's Foundrez 7500 series of powdered phenol-formaldehyde resins, designed especially for shell molding, includes:

FOUNDREZ 7500 — a general purpose phenol-formaldehyde resin. Features long flow and cure. This product is especially applicable to intricate-pattern work.

FOUNDREZ 7504 — formulated for intermediate flow and long cure properties. Ideal for the jobbing shop where many different types of castings are made. May be employed on a variety of pattern contours.

FOUNDREZ 7506— has the shortest flow and fastest cure of the series. Compounded for high speed production of shells. Most suitable where foundry production involves long runs of a few types of castings.

If you would like further information on the Foundrez 7500 series, write for Technical Bulletin F-3-R. Reichhold Chemicals, Inc., RCI Building, White Plains, New York.

Circle 616 on Page 53

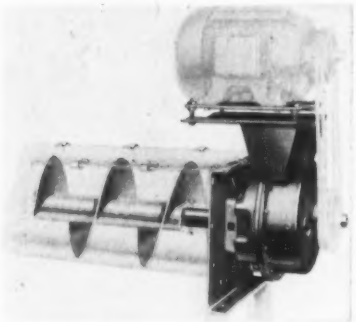
side by side. The machine can be lifted with a fork lift truck and moved to any location.

Standard equipment includes automatic timer, automatic pressure relief valve in cover, barrel speed controls, and drive unit with heavy duty, helical gear speed reducer. Other features are a variable speed drive for barrel speeds between 8 and 24 rpm, a built-in brake motor, and a limit switch which permits jogging but not running of the barrel when the guard is raised. Total capacity is 2000 lb.—**Baird Machine Co.**, 1700 Stratford Ave., Stratford, Conn.

For More Details Circle No. 484—Page 53

HELICAL GEAR DRIVE

Helical gear drive for screw conveyor installations is manufactured in six sizes, each with four ratios.



The unit has optional motor mount and trough end. Drive shafts are removable, and tapered roller bearings absorb thrust from the screw conveyor, thus eliminating need for thrust bearing on trough end. Choice of seals is offered between conveyor and reducer.—**Falk Corp.**, Dept. 255, Box 492, Milwaukee 1, Wis.

For More Details Circle No. 485—Page 53

ELECTRIC HOISTS

An improved and expanded version of the former line of S series Quik-Lift electric hoists is designed for rugged continuous service. The 12 models range in capacities from ½ to 3 tons and speeds from 9 to 36 fpm. They come with pushbutton or pendent control. Both controls are said to permit load movement of a fraction of an inch for precise spotting. The oversized instantaneous shoe-type brake is accessible for quick adjustment. Link-type coil chain is made of high-grade alloy steel. All bearings are sealed. Hoists can be supplied with either hook or multipurpose lug suspension.—**Coffing Hoist Div., Duff-Norton Co.**, Danville, Ill.

For More Details Circle No. 486—Page 53

THERMOCOUPLE WIRE

Thermocouple wire is of magnesium oxide-packed, metal sheathed construction. Where high temperatures, size, and adaptability are primary factors, Pycopack wire has extensive usage. The wire now is available in seven sizes from 5/16 to 1/40 in. sheath OD.—**Pyrometer Co. of America Inc.**, Sales Dept., Penndel, Pa.

For More Details Circle No. 487—Page 53

GRINDING WHEELS

Resin-bonded depressed center and cup wheels have been added to the company's line. The Magnecoating process vertically positions the grit particles for greater concentration and literally stands them up on end to produce more cutting edges. This process deters filling, and new biting edges are created constantly by top particle breakoff. —**Abrasive Co. of America**, 492 Main St., Fort Lee, N. J.

For More Details Circle No. 488—Page 53

FLEXIBLE SHAFT MACHINE

Multispeed, suspension-type flexible shaft machine Model V50 has a swivel mounting and a hook for hanging up or connecting to an

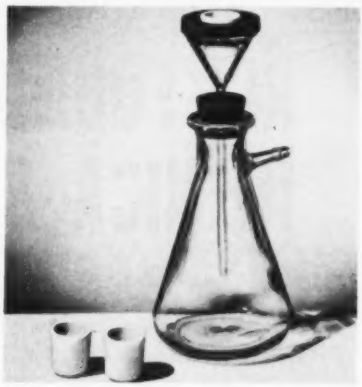
overhead trolley. Said to be ideal for grinding castings, it is easily handled on jobs like grinding the inside of cast iron pipe, as shown here. Other uses include buffing, sanding, wire brushing, and drilling.

The unit operates at four different speeds, from 1150 to 5750 rpm, and is furnished with a 6-ft flexible shaft. Because the countershaft pulley is mounted on the eccentric, speeds are changed easily. The machine is available with ¾, 1, 1½, 2, or 3-hp motors.—**Stow Mfg. Co.**, 18 Shear St., Binghamton, N. Y.

For More Details Circle No. 489—Page 53

FILTERING CRUCIBLE

Porous filtering crucible is for the determination of graphitic carbon in cast iron. Samples are filtered



directly into the unit and subsequently combusted in a high-frequency furnace. This system eliminates the use of asbestos.—**Laboratory Equipment Corp.**, Hilltop Road and Lakeview, St. Joseph, Mich.

For More Details Circle No. 490—Page 53

SLOTTED REFLECTORS

Slotted reflectors are available for both explosion proof and vapor-tight lighting fixtures. They eliminate harsh brightness contrast, improving visibility and seeing comfort. The up-light of the reflectors eliminates dark, dungeon-like areas above reflectors. Fixture operating temperatures are lowered. Circulation of air through the reflector reduces accumulation of dirt and dust, simplifying maintenance.—**Crouse-Hinds Co.**, Syracuse 1, N. Y.

For More Details Circle No. 491—Page 53

PERMANENT MAGNETIC PULLEY

Radial pole, permanent type magnetic pulley is said to provide high magnetic strength across the entire width of conveyor belts and optimum removal efficiency at high operating speeds. Pulley incorporates a ceramic magnet material, Ceramox V, to promote fast and continuous separation of tramp iron from deep burdens. The unit is automatic and is made of stainless steel. —**Dings Magnetic Separator Co.**, 4740 W. Electric Ave., Milwaukee 46, Wis.

For More Details Circle No. 492—Page 53

Beach wear by Jantzen

"SEMI-STEEL" ABRASIVES

$155.00 *per ton*

"SEMI-STEEL" is manufactured as shot and grit, to S.A.E. specifications. 50 or 100 lb. bags, palletized if desired.

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Circle 617 on Page 53

Members of GIFS board of directors, seated, left to right, are: J. Tom Boyd, Austin B. Sayre, William G. Butler, Robert W. Wilder, Albert M. Nutter, J. Edward Quest, Cecil R. Garland, A. Lysle Dyer (outgoing), John C. Long, and J. Douglas James. Standing, left to right: J. Scott Parrish Jr., Hermann P. Good, Waldron G. Greenlee, Summerfield Brunk, Robert E. Crowe, William A. Hepburn (outgoing), Clayton D. Russell (outgoing), and Charles R. Gregg

West Coast Is Host to

Gray Iron Founders' Society

By FRANK G. STEINEBACH
Editor

● THE BEAUTIES of California and the romance of San Francisco, with its cable cars, Fishermen's Wharf, Chinatown, and hundreds of interesting places to visit, were magnets that drew one of the largest crowds in recent years to the 31st annual meeting of the Gray Iron Founders' Society, held in that city Oct. 7-9.

Typical western hospitality was provided by a local committee headed by Clayton D. Russell, Phoenix Iron Works, Oakland, Calif., as chairman and George L. Nimocks, Dayton Foundry Co., Hollydale, Calif., as vice chairman.

GIFS officers for 1959-60: Front row, left to right, Albert M. Nutter, president, and J. Edward Quest, vice president; back row, left to right, Cecil R. Garland, treasurer, and Robert W. Wilder, secretary

A wide variety of subjects was presented at the meeting. Using the same technique as in 1958, the president and the headquarters staff sat at a speakers' table during the opening session and discussed informally and in some detail the various areas of society work. Those participating were A. M. Nutter, E. L. LeBaron Foundry Co., Brockton, Mass., president of the society; Donald H. Workman, executive vice president; Richard C. Meloy, marketing director; Charles F. Walton, technical director; William L. Caldwell, assistant secretary; and E. Harold Mitchell, field director.

In the face of exceptional promotion being given other metals, it was of special interest to learn that the society and venders of materials used by the gray iron industry are exploring the possibility of a joint promotion effort for gray cast iron.

The tremendous success of castings design clinics for users of castings was discussed. The society staff staged 22 of these clinics in 19 cities during the year, presenting the information to 660 partic-

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Circle 622 on Page 53

ipants from 300 companies. The group is scheduling 11 additional clinics in eight cities during the coming year. A new series of sales training clinics and a refresher course for those who attended two years ago are being planned.

Shortly, a comprehensive industry statistical survey will be undertaken to find out where castings are going to be used, in what quantities, and overall possibilities within individual companies. From this study it is hoped to be able to develop a new industry capacity figure.

Tribute was paid to the exceptional work of the various committees and the development of guided activity which will keep the association two or three years ahead of the procession. Reports indicated that the society has received increased attention in the technical and business press and that refinements and improvements have been made in *Gray Iron News*, the society publication.

Technically, the society has undertaken a study of dimensional tolerances of castings, and this information was presented. It was pointed out that pressure from customers for information on what tolerances can be expected is growing. Another project dealt with surface finish as influenced by cleaning of castings.

Samples of three types of iron, Class 25, Class 50, and ductile, all of which had been cleaned by shot blasting, were exhibited. Half of the samples had been annealed and the others used as-cast. The surface first was ground so that the results were comparable. These tests showed that surface roughness varies inversely with hardness, regardless of the cast shape. The best surface that can be secured is determined by abrasive size; the coarser the abrasive, the rougher the surface finish.

It was also pointed out that ASTM Committee A-3 is revising specification A-48, and this revision will provide changes in procedures followed by foundrymen.

A further review of society activities was presented in a number of committee reports. The Advertising Committee reported on the success of the initial issues of "Gray Iron Designers' Digest," which have been mailed to 15,000 design engineers, owners, purchasing agents, and interested industrial personnel, and stated that the program will continue. The society's *Buyers' Guide* was published during the year and distributed. Another design contest was held; results were announced during the meeting and are presented later in this report. A series of advertisements has been scheduled for 1960.

During the year, the Cost Committee reviewed Chapters 3-6 of the forthcoming publication *Cost Control Procedures*. Twelve chapters of that publication have been prepared by John L. Carter, cost consultant of the society. The cost committee also has been concerned with furthering local cost activities.

The Marketing Committee stated that the casting design clinics, staged during the year by the technical and marketing directors, have drawn users closer to member foundries, have given designers greater confidence in gray iron castings, and have encouraged those attending to investigate gray iron in new applications. The committee also is completing a member interest survey which will provide much helpful information for the Program Evaluation Committee.

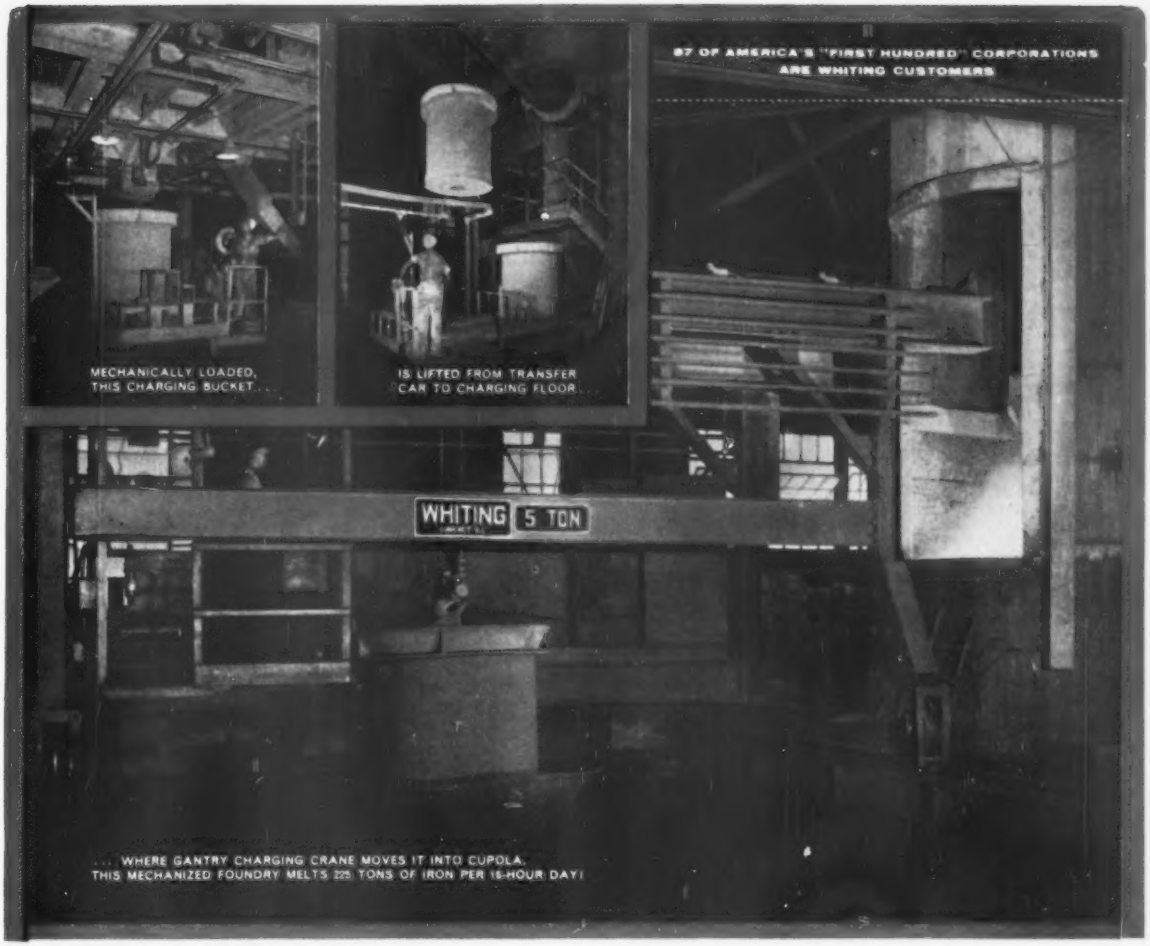
Consider Future Programs

During the year the Program Evaluation Committee considered progress made in applying recommendations of the original committee and has indicated programs that should be given careful study during the coming year.

The Safety Committee reported that safety bulletins have been issued to top management and that a manual, "Starting a Foundry Safety Program," has been published and distributed to GIFS foundries. This booklet has been prepared particularly for small and medium-sized shops. To help eliminate specific hazards, the committee has completed a simplified "Safety Check List" for making periodic departmental inspection.

Frank G. Steinebach, editor of FOUNDRY and president of the Foundry Educational Foundation, told the Gray Iron Founders Society that the foundation has made a tremendous contribution to the foundry industry since its organization 11 years ago. He pointed out that 1800 graduates of engineering schools have entered the foundry industry in that period and that more than 63,000 students have taken foundry courses at FEF schools. These young engineers have developed a knowledge and appreciation of foundry as an engineering process

E. L. Roth, below, receives the GIFS gold medal and W. A. Hepburn, right, and C. R. Garland, lower right, receive citations from H. P. Good, chairman, citation and awards committee


MECHANICALLY LOADED, THIS CHARGING BUCKET...
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87 OF AMERICA'S "FIRST HUNDRED" CORPORATIONS ARE WHITING CUSTOMERS
WHITING 5 TON
... WHERE GANTRY CHARGING CRANE MOVES IT INTO CUPOLA. THIS MECHANIZED FOUNDRY MELTS 225 TONS OF IRON PER 16-HOUR DAY!

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New mechanization at American Radiator and Standard Sanitary Corporation, Baltimore, has resulted in an immediate ⅓ reduction in charging time! Here, in a refurbished foundry, Machine Age speed is accompanied by economy and reliability. A Whiting Yard Crane now unloads scrap metal . . . and Whiting Cupolas, Ladles, Weigh Hoppers and a Gantry Charging Crane team up to produce more, and produce it faster. Practical allocation of manpower helps American-Standard pare its over-all production costs even more!

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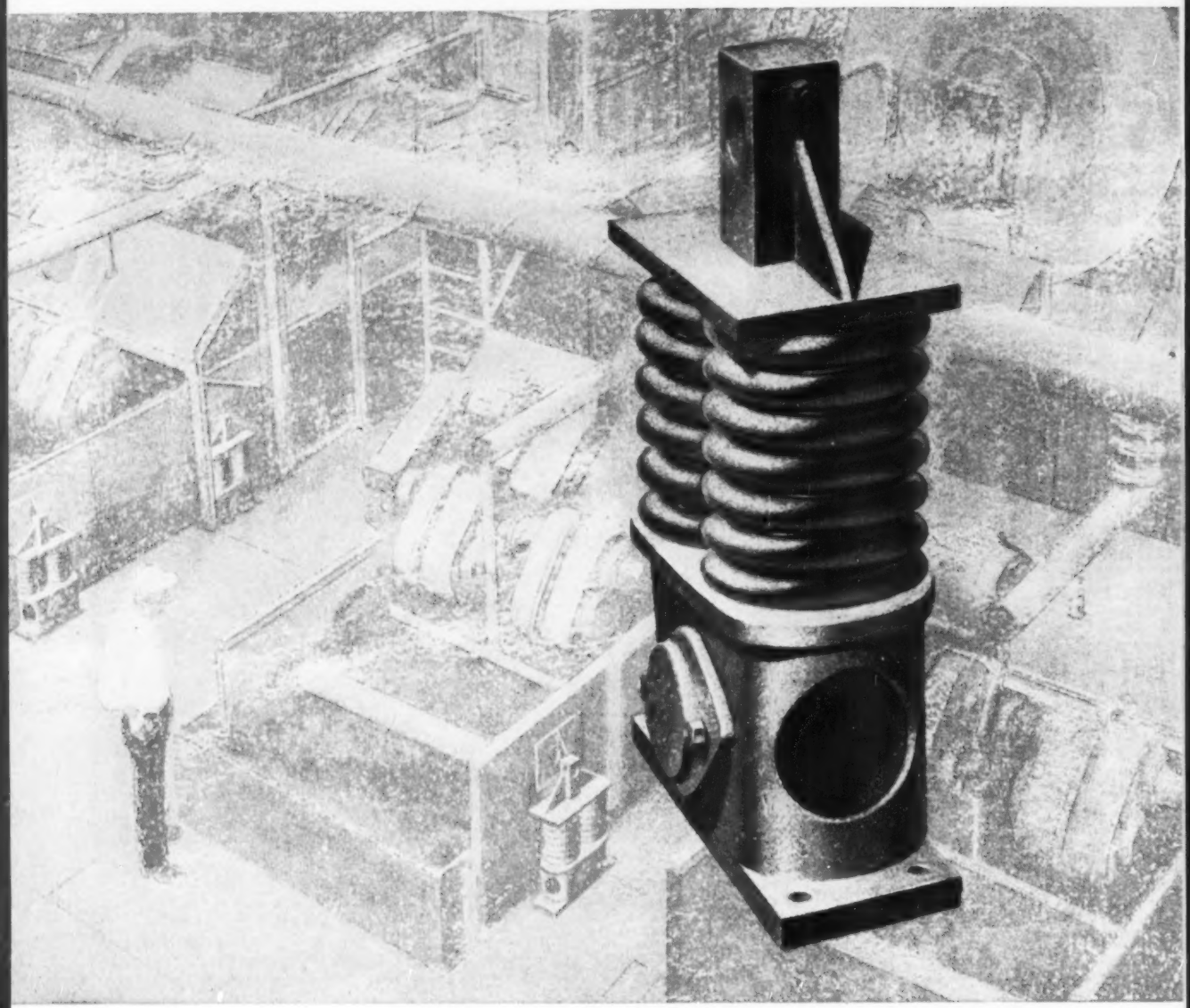
How the Foundry Industry Serves America . . . #4 of a Series



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When the spring bases of this big vibrating screen were redesigned from plate weldments to gray iron castings, it effected not only a substantial cost saving, but also provided maximum stability to the structure.

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Modern foundries look to the Hanna Furnace Corporation for their supplies of all regular grades of pig iron . . . foundry, malleable, Bessemer, intermediate low phosphorus as well as HANNATITE® and Hanna Silvery.

Facts from files of Gray Iron Founders' Society

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THE HANNA FURNACE CORPORATION
Buffalo • Detroit • New York • Philadelphia
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NATIONAL STEEL CORPORATION

Circle 620 on Page 53

and of cast metals as engineering materials. Many of these men find employment in industries using castings.

He cited a growing need for engineers in the foundry industry and indicated that the Foundry Educational Foundation program offers the best and the most economical method of meeting these needs. Started as an experiment, the FEF now has proved its worth as a limited program, which has been well done. The complete task lies ahead. Therefore, the speaker urged the industry to meet the challenge by providing even greater support for the foundation.

J. Hart Clinton, Morrison, Foerster, Holloway, Shuman and Clark, San Francisco, traced in some detail the various provisions of labor-management legislation of 1959. He indicated that it affects both unions and management, and he urged careful study on the part of management to avoid conflict with important features of the law. He predicted that labor unrest may increase since unions probably will be militant, at least for a while. However, the good aspects of the new legislation outstrip the features which may create problems.

Management Faces Crisis

Dr. Louis F. Hackemann, Hackemann & Associates, spoke on "What Kind of a Guy Are You?" and expressed the opinion that management of American industry now is facing its greatest crisis. For the first time, management is faced with the problem of high cost and low quality. In 1958 the number of businessmen seeking needs in foreign markets increased greatly, simply because of poor quality and high cost at home. Foreign manufacturers are making products far cheaper and in many instances of better quality than those made here.

Dr. Hackemann suggested that management must improve its technical processes to the highest degree; must make a more deliberate attempt to develop high competency in management; and must make it a business to improve on workers' attitudes toward their jobs and good workmanship. The idea of wanting more money for as little work as possible must be changed. Dr. Hackemann then asked whether you, as management, are willing to look at yourself squarely and honestly to see whether you have the ability and emotional stability to handle the problem. He emphasized that there is no place for mediocrity in our modern industrial picture because competition will get keener.

Starting the second day's session, H. R. Clauser, editor, *Materials in Design Engineering*, presented the results of a survey in a paper called "How Industry Selects and Specifies Materials." He stated that selection is a co-operative process which involves several different activities, including investigation, evaluating, consulting, and reviewing. Trying to determine what material to use is a process which starts early in the design and continues into the production period.

Many Involved in Selection

In the fields covered by the survey, from 50,000 to 75,000 are involved with material selection. These people are located in several different departments of those industries. In 85 per cent of the companies, the engineering and design departments have most to do with such selection. Other departments interested include research and development, production and manufacturing, materials, and top management. The study was made in plants fabricating metal products, making machinery, electrical machinery and equipment, transportation equipment, and professional, scientific, and control instruments.

Sterling Brubaker, associate economist, Bank of America, San Francisco, discussed the "Economic Outlook for 1960." He stated that the total gross national product in 1959 will be in the neighborhood of $480 billion. In 1960 we can expect a GNP of about $514 billion. This growth of approximately 7 per cent will put us well into the much heralded $1/2 trillion economy, a level which might have been reached by the end of 1959 if there had been no steel strike. The speaker predicted that the coming year will be good for most lines of business. Retail trade will be excellent, and auto and appliance dealers will prosper again after lean years. Machine rebuilders also should be busy.

He warned, however, that it will be a competitive year. The manu-

In the interest of the American foundry industry, this ad (see opposite page) will also appear in

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Eastern Clay Products produce, and Hickman, Williams & Company sell and distribute these well-known brands:—Cupoline; Dixie Bond; Revivo Bond; Plasti-Bond; Black Hills Bentonite; Lawco Fire Clay—all to make castings better and reduce chances of molding failures.

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facturer who hopes to make do with out-of-date equipment soon may find himself out of date. The production capacity of American industry is more than adequate to meet our needs, and the prize will go to the efficient. American firms will be facing the threat of foreign competition.

Prices should be fairly stable. The extent of unemployment serves as one restraint of business. The detrimental attitude of our monetary and fiscal policy makers is another deterrent. Competition from abroad provides another problem.

Marketing Is a Challenge

A longer range prediction was made by Richard C. Meloy, GIFS marketing director, who spoke on "Marketing in the '60s." Mr. Meloy believes that tomorrow's big challenge is success in new products and new marketing activities. Foundries are going to be less concerned about tonnage of iron and more concerned with castings as component parts. If foundrymen are to increase their markets, they must get closer to their customers, including their wants, needs, and objectives, than in the past. Changing the thinking of the industry to develop such practices can lead to better business for gray iron foundries because it encompasses better service to the customers.

A new market activity along that line will lead to more high-strength castings and to better designed, lighter weight castings. It will include more shell cored and shell molded castings. But it also will lead to better quality and better finish of sand castings.

Mr. Meloy believes that all of the opportunities for better business in the '60s will develop from getting to know customers better, helping them achieve their goals, and letting them know that the foundry is doing these things. Although the industry may not be able to expect a comparable increase in tons of castings, there certainly are comparable profit possibilities. Mr. Meloy believes that there are profitable opportunities for the gray iron industry during the '60s if individual foundries will take advantage of them.

Albert M. Nutter was re-elected president of the society. J. E. Quest, president, Shakopee Found-

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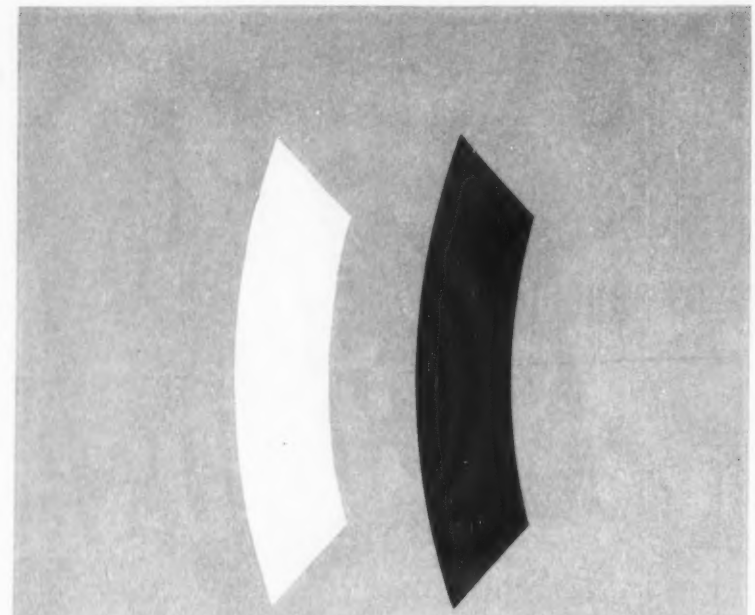

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in buying blast cleaning abrasives, too, low price is just an illusion

It's abrasive quality that really matters. Take hardness, for instance. Top quality Wheelabrator Steel Shot is the hardest steel shot ever made — almost 10 RC harder than lower priced steels. It hits harder, cleans faster, rebounds better to clean hard-to-reach areas. And it lasts much longer than softer abrasives.

For faster production and better finish — for *true* blasting economy, use high quality Wheelabrator Steel Shot. Prove it in your own equipment.

WRITE TODAY FOR THIS NEW HANDBOOK

of blast cleaning abrasive performance data, full of charts and facts to help you control abrasive consumption and cleaning costs. *Write to Wheelabrator Corp., 505 S. Byrkit St., Mishawaka, Ind. In Canada, write to Wheelabrator Corp., Canadian Div., P.O. Box 490, Scarborough, Ontario.*

WHEELABRATOR

STEEL ABRASIVES

ry, Shakopee, Minn., was re-elected vice president; Cecil R. Garland, secretary and comptroller, W. O. Larson Foundry Co., Grafton, Ohio, was re-elected treasurer; R. W. Wilder, secretary, Elkhart Foundry & Machine Co., Elkhart, Ind., was named secretary. Donald H. Workman was re-elected executive vice president.

New directors are as follows: Summerfield Brunk, president, Headford Bros. & Hitchins Foundry Co., Waterloo, Iowa; Robert E. Crowe, president and general manager, Crowe Foundry Ltd., Hespeler, Ont.; Hermann P. Good, division manager, Textile Machine Works, Foundry Div., Reading, Pa.; John C. Long, secretary-treasurer, Atlas Foundry & Machine Co., Tacoma, Wash., and Cecil R. Garland.

Gold Medal Is Awarded

Edward L. Roth, president, Motor Castings Co., West Allis, Wis., was awarded the gold medal of the society for his many contributions and services to the society and the industry. He has served as the organization's president, member of the board of directors, chairman of the Technical and Statistical Committees, member of the Handbook and Program Evaluation Committees, and as industry representative of various government advisory committees in periods of national emergencies.

Cecil R. Garland and William A. Hepburn, vice president and treasurer, John T. Hepburn Ltd., Toronto, Ont., were given citations for their unselfish contributions and services to the society. Presentations of the medal and beautiful illuminated scrolls were made by Hermann P. Good, chairman, Citations and Awards Committee.

Awards in the 1959 Annual Design Contest were made at the final luncheon. First prize of $500 with citation was presented to Jack T. Eccles and Dan H. Davis, Rockford Machine Tool Co., Rockford, Ill. The winning entry was conversion of a prototype machine tool casting originally designed of welded steel.

Second place and a cash prize of $100 with citation went to Joseph D. Walls, Roots-Connersville Blower Div., Connersville, Ind., for the design of an integrally cast rotor and shaft in a spiraxial compressor.

Tied for third place with a cash

ROUGH GRINDING

One of Many Jobs Where the
NEW AO COVERGLAS GOGGLE
Protects and Fits 99% of Workers

Meet the new AO 325 Chippers' Goggle — with a wide range of vision and fitting ease.

Here's a goggle that exceeds government specifications: (1) lenses measure 50 mm. round (2) goggle fits over all types of correction spectacles, including those with decentered temple pieces.

In addition to superb fitting qualities (proven by tests), the 325 simplifies lens stocks since it accommodates 50 mm. round lenses — standard in all other type cup goggles regularly used. This goggle has increased ventilation and a more attractive appearance. Frames are cellulose acetate, opaque brown.

Perforated aluminum side shields for ventilation will not corrode. Adjustable leather bridge. Available with rigid bar bridge as 325B and with adjustable rigid bridge as 325R. Protects against flying particles in shipping, grinding, etc. Companion welders' model is No. 329. Your nearest AO Safety Products Representative can supply you.

Photo courtesy of Draper Corp., Hopedale, Mass.

Always insist on AO Trademarked lenses and frames

American Optical
COMPANY
SAFETY PRODUCTS DIVISION
SOUTHBRIDGE, MASSACHUSETTS
Safety Service Centers in Principal Cities

Circle 624 on Page 53

A Report on

CHICAGO

grinding wheels for metal fabricators and foundries

Today, the Chicago Type 11 Taper Cup, pictured above, is the safest, fastest, most economical wheel for metal fabricators and foundries.

Users of grinding wheels on metalworking and foundry applications can expect the ultimate in engineering design and maximum safety from every Chicago Wheel. We offer you a wide range of wheels including straight and depressed center Reinforced Resinoid—Type 27 Hi-Ply, Chicago Flex; Type 11 Resinoid Taper Cups with Carroll pressed metal safety backs; and a complete range of mounted wheels.

We would like to hear from you regarding your particular application. There is a Chicago Wheel sales representative in every major industrial area, ready to serve you.

Write for Chicago Wheel Bulletin F-11
Special catalog for metal fabricators and foundries illustrates grinding wheels, gives you prices and quantity schedules. Write for your free copy today.

CHICAGO WHEEL
& MFG. CO., 1101 W. Monroe Street
CHICAGO 7, ILLINOIS

deburring small parts

smoothing large castings

chamfering structural steel

weld grinding

award of $50 and certificate of recognition were Leroy Barnes, Oliver Corp., Shelbyville, Ill.; Michael E. Conway, at the time of the contest with Enterprise Engine & Machinery Co., San Francisco, now with Yuba Consolidated Industries Inc., San Francisco; Wes Swan and Walter Pochila, Chicago Hardware Foundry Co., North Chicago, Ill.; Jay M. Roth, Mechanisms Co., Urichsville, Ohio; Charles Brolin and Phil McCaffery, Link-Belt Speeder Corp., Cedar Rapids, Iowa.

The contest is intended to encourage the most effective use of gray and ductile iron castings by consuming industries and to uncover economical conversions from other materials. The awards and citations were presented by H. R. Clauser, who served as chairman of the Design Contest Judging Committee.

NFA Announces Program for New York Annual Meeting

National Foundry Association will hold its 61st annual meeting Nov. 5-6 at the Hotel Roosevelt, New York. Participants will divide up into small groups, according to unions in their shops, to discuss developments in the various sections of the country and to assess immediate and long-range goals of each particular union.

Program details follow:

Thursday, Nov. 5

9:10 a.m.—Reports of the president and executive secretary.

10:40 a.m.—Presentation of Annual "Herman" Awards to outstanding speakers on last year's program.

11 a.m.—Concurrent sessions. **International Molders' Union:** Discussion leaders, Fred D. Hunter, American Brake Shoe Co., New York, and William S. Thomas, Emmaus Foundry & Machine Co., Emmaus, Pa. Staff representative, William Bulman. **United Steelworkers' Union:** Discussion leaders, Howard Winterson, Blaw-Knox Co., Pittsburgh, and Albert Blum, Cooper Alloy Corp., Elmira, N. Y. Staff representative, Charles Sheehan. **United Auto Workers' Union:** Discussion leaders, John Sulga, Kelsey-Hayes Co., Detroit, and Phil Hahl, Sibley Machine & Foundry Corp., South Bend, Ind. Staff representative, Eugene Schlickman. **Other Unions**—Electrical Workers, AIW, UMW, IUOE, FLU, etc. Discussion leaders to be assigned. **Nonunion Shops:** Discussion leader, Martin J. Ewald, Detroit counsel.

12 noon—Luncheon: **The Unscrutinized Drift of International and Industrial Relations,** Godfrey P. Schmidt, monitor of the Teamsters' Union.

2 p.m.—Concurrent sessions continued.
5:30 p.m.—Reception.

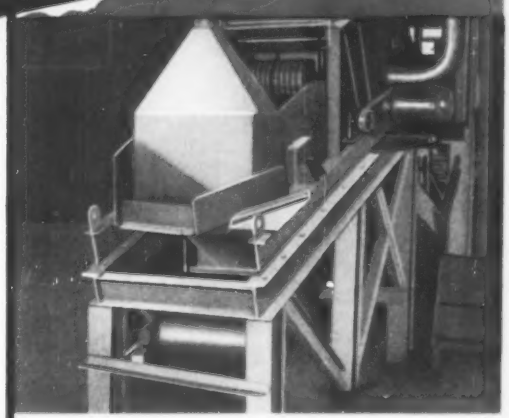
Friday, Nov. 6

9 **a.m.—Foreman Training in Labor-Management Relations,** A. B. Schwarzkopf, U. S. Pipe & Foundry Co., Bessemer, Ala.

10 a.m.—Summary Session: Discussion leaders will evaluate the concurrent union discussions, with a commentary on steps which should be taken by foundries.

12 noon—Luncheon: **Achieving Bargaining Equality,** Lemuel R. Boulware, General Electric Co., Schenectady, N. Y.

SALVAGE YOUR VALUABLE MOLDING SAND with a SIMPLICITY RING-TYPE CRUSHER SCREEN



188

You profit two ways with Simplicity's Ring-Type Crusher Screens

- Your used core and molding sand is crushed and screened for re-use in one operation, saving the cost of new sand.
- Transportation and dumping costs of used sand are eliminated.

This unit combines the Simplicity heavy-duty vibrating screen with free-turning cast rings mounted over crushing plates. One to three sets of rings can be supplied, depending upon the maximum lump size to be crushed.

Simplicity ring-type crusher screens are paying their way in foundries producing magnesium, steel, malleable and grey iron castings throughout the United States.

Available in many models and sizes. For complete information write today for the name of our sales engineer in your area; and turn your waste into profits.

SALES REPRESENTATIVES IN ALL PARTS OF THE U.S.A.

FOR CANADA: Simplicity Materials Handling Limited, Guelph, Ontario.

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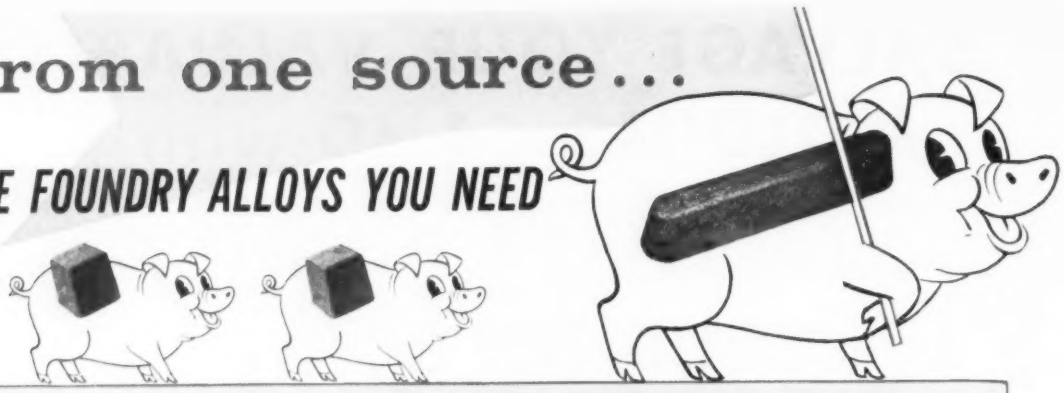
Circle 626 on Page 53

From one source...

THE FOUNDRY ALLOYS YOU NEED



ALLOYMET ADDITIVE ALLOYS

Available in pig, piglet, bar and shot

ALLOYMET Number	Nominal Analysis	General Application
1000 1002	99.8 Cu 98.5 Cu	addition of Cu to irons
2000 2008 2041	99.5 min. Ni 92 Ni, 5.5 Si 59 Ni, 29 Si	addition of nickel to irons and steels
2130 2140 2165	70 Ni, 10 Cr 60 Ni, 15 Cr 35 Ni, 15 Cr	nickel and chrome alloying of iron and steel
2154	46 Ni, 20 Cr	production "Ni-Hard"*
2200	57 Ni, 23.5 Cu, 8 Cr	production "Ni-Resist"*
2350 2365	50 Ni, 50 Fe 36 Ni, 64 Fe	addition of nickel to cupola and ladle
2454 2468 2480	46 Ni, 20 Mo, 15 Cr 32 Ni, 10 Mo, 15 Cr 20 Ni, 20 Mo, 20 Cr	engineering irons
2530	70 Ni, 30 Cu	Ni and Cu to iron
2530 mlg (QQ-N-288A)	62 min. Ni, 26 min. Cu, 2.5 max. Fe	"Monel"* castings
2523 2530M	60 Ni, 23 Cu 65 Ni, 30 Cu, 5 Fe	Ni and Cu to steel

*INTERNATIONAL NICKEL COMPANY

All SAE, AISI and ACI Stainless Steel Master Alloys

DUCTIMET INOCULANTS FOR DUCTILE IRON

Available in All Screen Sizes

	Mg	Si	Cu	Ce	Fe
DUCTIMET #30	8	45	5	—	Balance
DUCTIMET #35	8	45	5	0.5	Balance
DUCTIMET #31	12	39	16	—	Balance
DUCTIMET #40	9	46	—	—	Balance
DUCTIMET #45	9	46	—	0.6	Balance

ALLOY METAL PRODUCTS, Inc.

World's largest producer of secondary nickel alloys

2333 ROCKINGHAM ROAD
DAVENPORT, IOWA

Circle 627 on Page 53

Industry Briefs

Anderson Electric Corp., Birmingham, plans construction of a new office building adjacent to its aluminum foundry at Leeds, Ala., to house its sales, engineering, accounting, and production control departments and executive offices. The two-story brick and steel building will cover 13,000 sq ft and will provide consolidation of company operations in one location.

Advance Foundry, Dayton, Ohio, has developed a sand casting process, called Tru-Cast. It is said to produce castings so smooth in surface finish and so precise in pattern duplication that they are used without further processing for some applications and with a minimum of finishing for others.

Swindell-Dressler Corp., Pittsburgh, has been acquired by Pullman Inc., Chicago, and will be operated as a subsidiary at its present location in Aspinwall, Pa. William H. Cosgrove continues as board chairman and Harold I. Martin as president of Swindell-Dressler.

Allis-Chalmers Mfg. Co., Milwaukee, has acquired Valley Iron Works Co., Appleton, Wis., which will be operated as a subsidiary. Valley Iron Works Corp. will continue to manufacture papermaking machinery, with present officers, sales organization, and staff.

Singleton Sheet Metal Works Inc., 700 N. Chester Ave., Pueblo, Colo., has been incorporated by Leonard M. Singleton, Nadine Singleton, and Harper L. Abbot. Services will include a foundry, general metalworking, and fabricating.

Crane Co., Chicago, has purchased all properties and assets of Chapman Valve Mfg. Co., Indian Orchard, Mass., for $11,197,377. The plant will operate as a wholly owned subsidiary, under the same name, and will retain its present management and executive staff. Plans for the Chapman plant include manufacture of all its products of the present line for which there is adequate demand.

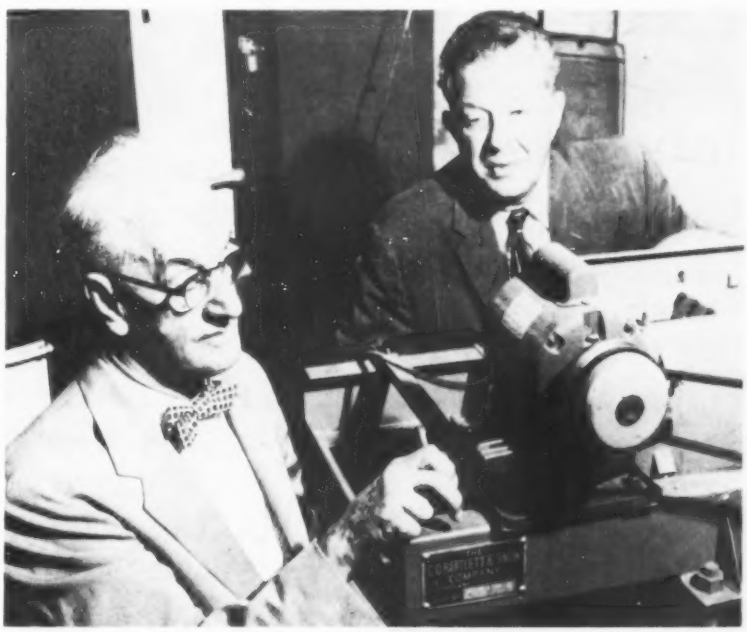
Crawford Steel Foundry, Bucyrus, Ohio, has completed reconstruction of its plant, which was almost completely destroyed by fire last February. Estimated cost of rebuilding was nearly $1 million. Crawford Steel is a subsidiary of Miller Mfg. Co., Detroit.

Dabney Foundry & Machine Works Inc., Lynchburg, Va., has been sold to a new corporation to be known as Dabney Machine & Co. Hans Lange, formerly of Babcock & Wilcox Co., New York, is president of the new company.

F. J. Stokes Corp. plans construction of a 50,000-sq-ft addition to its plant at 5500 Tabor Rd., Philadelphia. The new facilities, expected to be completed by the middle of 1960, will increase manufacturing and assembly capacity by about 20 per cent.

Wheelabrator Corp., Mishawaka, Ind., has acquired Lake Erie Machinery Corp., Buffalo, and will operate it as a wholly owned subsidiary. Lake Erie will continue to manufacture diecasting machines, hydraulic and extrusion presses for metal processing industries, and printing industry equipment.

Spec Products has been formed as a small business research, development and defense production pool in the Denver area to engage in space age development. Resources of three companies have been combined under provisions of the Small Business Act. B. K. Sweeney Mfg.



VIBRATING SCREENS: C. O. Bartlett & Snow Co., Cleveland, has purchased the product line of William L. Wettlaufer, Buffalo inventor and specialist in vibratory screens and related equipment. Mr. Wettlaufer, left, shown here demonstrating a feature of a screen to Charles O. Bartlett, vice president, has joined Bartlett & Snow as a consultant. Mr. Wettlaufer is the inventor of a variety of devices, including the Niagara line of therapeutic chairs, tables, and portable units. He will work on new processing equipment development and also will do special application engineering

Foundry Facts!

FIVE ACRES OF HALF DOLLARS!

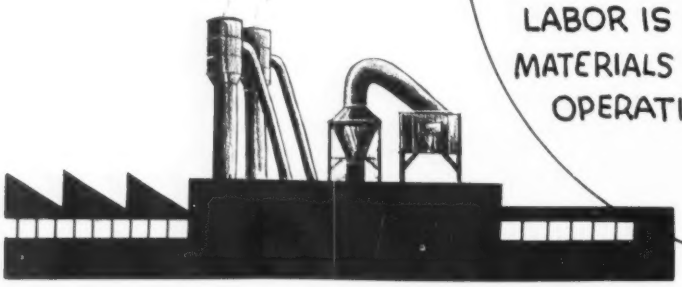
THAT'S HOW MUCH THE **FOUNDRY** INDUSTRY SPENDS ANNUALLY FOR WELDING EQUIPMENT AND SUPPLIES...**$7,000,000**

ALUMINUM PACES GROWTH!

USE OF ALUMINUM CASTINGS IS GROWING RAPIDLY. 37% INCREASE IN NUMBER OF ALUMINUM FOUNDRIES AND 75% INCREASE IN TOTAL PRODUCTION OF ALUMINUM CASTINGS SINCE POST-WAR YEARS

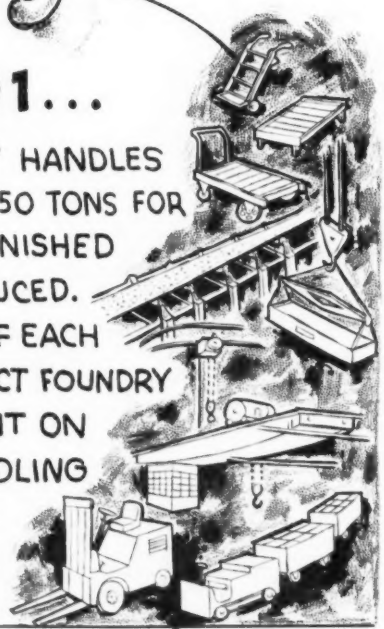
FOUNDRIES ARE GOOD NEIGHBORS!

10% OF THE FOUNDRY INDUSTRY'S CAPITAL INVESTMENT GOES FOR EQUIPMENT TO KEEP DUST, SMOKE AND FUMES OUT OF THE AIR...



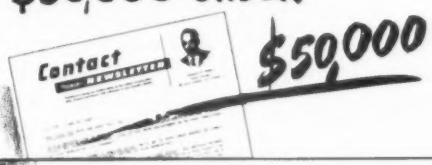
150 TO 1...

A FOUNDRY HANDLES APPROXIMATELY 150 TONS FOR EACH TON OF FINISHED CASTINGS PRODUCED. FORTY CENTS OF EACH DOLLAR FOR DIRECT FOUNDRY LABOR IS SPENT ON MATERIALS HANDLING OPERATIONS



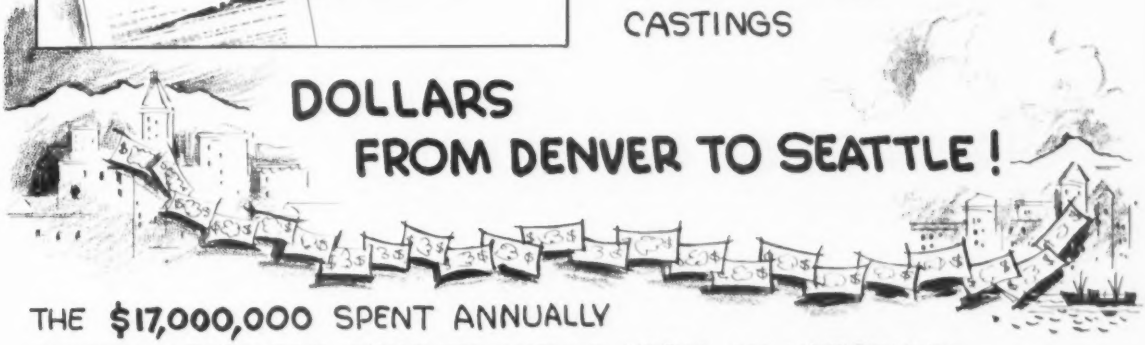
A $50,000 FRINGE BENEFIT!

IN OUR "CONTACT" NEWSLETTER, A PLUS SERVICE FURNISHED TO ADVERTISERS AND AGENCIES BY **FOUNDRY** MAGAZINE, **ONE ADVERTISER FOUND A PROSPECT WHO PLACED A $50,000 ORDER**



NOW THEY'RE MAKING CASTINGS FROM PHOTOS...

INVESTMENT CASTING PROCESS USES CONVENTIONAL PHOTOGRAPHIC METHODS TO MAKE WAX PATTERNS FOR PRODUCING FINELY DETAILED CASTINGS

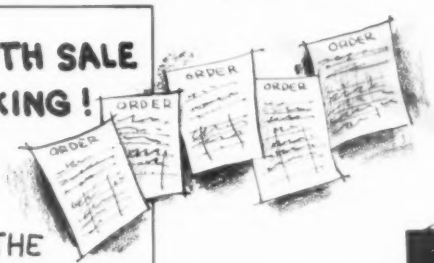


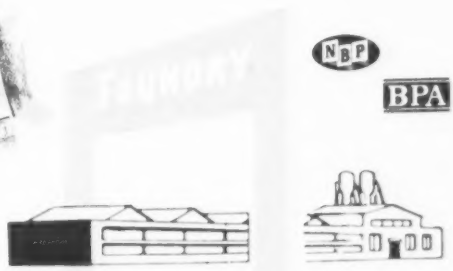
DOLLARS FROM DENVER TO SEATTLE!

THE **$17,000,000** SPENT ANNUALLY BY FOUNDRIES FOR **CORE OIL** WOULD FORM AN UNBROKEN ROW OF DOLLAR BILLS STRETCHING **OVER 1700 MILES**. IN ADDITION, FOUNDRIES PURCHASE **2,700,000 POUNDS** OF GREASE EVERY YEAR... UNDOUBTEDLY ENOUGH TO MAKE A VISIBLE SMEAR THE ENTIRE LENGTH OF THE EQUATOR

MISS EVERY FIFTH SALE TO METALWORKING!

THAT'S WHAT HAPPENS WHEN YOU OVERLOOK THE **FOUNDRY** MARKET FOR HEAT TREATING EQUIPMENT!





NBP BPA

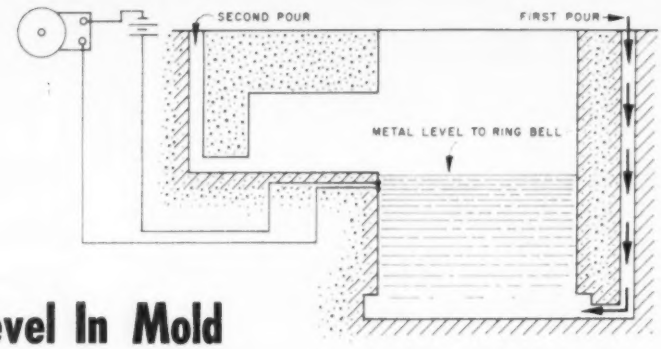
don't underestimate your potential in the foundry market!

a PENTON *Publication* / *Penton Building • Cleveland 13, Ohio*

HOW To Do It

FOUNDRY will pay a minimum of $15 for each "How To Do It" idea submitted and published

By M. J. BRAZIER
Wolverhampton, Staffs., England



Bell Signals Metal Level In Mold

A FAIRLY COMMON practice, particularly when heavy castings are being poured is to use two or more sprues and to delay pouring into the extra sprues until metal has reached a certain level in the mold cavity. The time to start pouring with the additional ladles commonly is determined by the molding foreman, whose judgment is based on experience.

A simple expedient to reduce possible error in human judgment is to locate, at the mold cavity surface, two bare wires at the level to which the mold should be filled before the second pour is started. The wires form part of a normal electric bell circuit. When metal in the mold reaches the level of the two wires, the circuit is closed and the bell rings. That is the signal for the second pour.

Co., 6300 E. 44th Ave., Denver, Colo., designs and produces tools and equipment for the aviation, railroad, trucking, and oil industries. McPherson Corp., 1361 S. Broadway, Denver, specializes in nonferrous castings. Physics, Engineering & Chemistry Corp., Boulder, Colo., is comprised of a variety of scientific personnel.

Simonds - Worden - White Co., Dayton, Ohio, has begun a $1/3 million program to expand manufacturing facilites of its grinding wheel division. To be completed by December, 1959, the 15,240-sq-ft addition will double grinding wheel production.

Crosby Foundry Sales has been formed at 19615 Lake Rd., Rocky River 16, Ohio, by L. T. Crosby, who formerly was associated with Sterling National Industries. The firm handles several lines of foundry equipment and supplies.

Cooper - Bessemer Corp., Mount Vernon, Ohio, has purchased Rotor Tool Co., Cleveland. Rotor Tool, manufacturer of air and high-cycle portable tools, will operate under the same name as a wholly owned subsidiary of Cooper-Bessemer. No changes of management or location of plant facilities is contemplated. Herbert P. Bailey, founder and president of Rotor Tool, will become a Cooper-Bessemer director.

Cagle Foundry, Little Rock, Ark., has started construction of a $60,000 building to employ about 26 workers. Another building will be constructed soon. Don and Burl Cagle are co-owners.

Standard Conveyor Co., North St. Paul, Minn., has appointed J. O. Winter & Associates, 2609 S. Broadway, Fort Wayne, Ind., to be its representative in that area.

National Acme Co., Machine Tool Builder, Buys Shalco

Facilities for production of Shalco standard shell core machines are being set up by National Acme Co. at one of its Cleveland plants. National Acme, 75-year-old machine tool builder, which recently acquired the Shalco Corp., plans to continue the development of new and special machines and auxiliary equipment at the latter's Palo Alto, Calif., plant.

Herbert von Wolff, Shalco sales manager, will have headquarters at Cleveland as manager of the new National Acme Shalco Div. Frank Shallenberger, professor of business administration, Stanford University, and recently president of Shalco, will continue as a consultant. Ashley Hollingsworth will be retained as chief engineer and Norman Swanson as works manager in California. George V. Harris, Racine, Wis., a foundryman and authority on foundry practice, also will be available as a consultant on shell molding applications.

Shalco Corp. was incorporated in January, 1953. It had its inception in 1951 when a group of Stanford students under the direction of Prof. Shallenberger undertook the development of an inexpensive, flexible shell molding machine for the small jobbing foundry. Its success prompted the decision to manufacture the machine. More recently the company has concentrated on the development and production of shell core machines.

With the Shalco addition, National Acme Co. has five divisions. Its Machinery Div. is concerned with the design, engineering, and production of single and multiple spindle bar and chucking automatics, related tooling, and accessories. An Electrical Manufacturing Div. produces solenoids, limit switches, motor starters, and pushbutton stations. Other units are the Threading Tool Div. and Contract Mfg. Div.

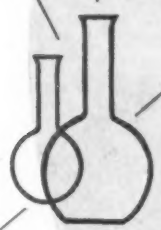
NEW!

A NEW NAME

FOR DELTA PERMI-BOND . . . AN IMPROVED FORMULA

SEA COAL AND PITCH REPLACEMENT

DELTA SAND·ADD



SEA COAL AND PITCH REPLACEMENT

300-4X Contains C, H, O, N.

Eliminate the DIRT, SMOKE, SOOT of PITCH and SEA COAL END ASH CONTAMINATION of YOUR SAND

Get Cleaner Castings . . . at Lower Cost

A new achievement by DELTA Research Scientists to provide these added advantages in your foundry:

- SAND·ADD is consistently uniform — chemically and physically.
- SAND·ADD completely eliminates ash contamination of the sand.
- THE IMPROVED VOLATILITY CURVE OF SAND·ADD PRACTICALLY ELIMINATES ATMOSPHERE CONTAMINATION BY GAS, SMOKE, SOOT AND DIRT CHARACTERISTIC OF OTHER PRODUCTS.
- Controlled liberation of gases to mold cavity by decomposition of SAND·ADD prevents casting blows and permits use of low permeability sand.
- SAND·ADD increases dry strength of sand 75 to 90%.
- SAND·ADD substantially reduces scrap castings by preventing casting defects.
- SAND·ADD cuts cleaning time and costs by improving casting finish.
- SAND·ADD is more economical to use and easier to control than sea coal or pitches.
- SAND·ADD is much cleaner and more foolproof to use than sea coal or pitches.
- On complete decomposition SAND·ADD leaves a total ash of less than .2%.
- SAND·ADD is completely volatile at elevated temperatures.
- SAND·ADD is specially compounded to provide exclusive advantages and contains verified amounts of C, H, O and N.

Change your records. Use the new name . . . DELTA SAND·ADD, when ordering the new, improved-formula Delta Sea Coal and Pitch Replacement. Working samples will be sent to you on request.

SAND·ADD has been thoroughly tested in various foundries under a variety of actual conditions and proved superior to every other product tested for the same purpose under similar conditions.

OUR 26TH YEAR

DELTA

DELTA OIL PRODUCTS CORP. | **MILWAUKEE 9, WISCONSIN**

MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

Circle 628 on Page 53

WAGE INCENTIVES

Increase Real Wages

Standard data plan provides consistency and fairness. Employees and management benefit from improved efficiency and productivity

● THE wage incentives program at Belle City Malleable Iron Co. and Racine Steel Castings Co., Racine, Wis., is in large part built around a standard data plan. Simply explained, the term "standard data" means predetermined measurements of how long it takes employees to perform the work motions (or elements) of their operations. The standard data normally are compiled from a large number of time studies and recorded in standard data books.

Use of standard data has proved to be one of the best methods of determining how much a man should produce because it possesses two outstanding attributes—fairness and consistency. It results in measures of time which are consistent from operation to operation, and it diminishes guessing about proper time measurements.

It has been indicated that standard data are the basis for a wage incentives program. The incentive, of course, is more money. The man on an incentive operation has an opportunity to increase his earnings in relationship to the efficiency and effort he puts into his work. This potential makes the program beneficial from the worker's viewpoint.

At the same time, the program is beneficial to the company. Increased efficiency and productivity are necessary to reduce the cost of making castings, thereby making possible competitive selling prices. In turn, this ability enables the company to keep its customers and makes for successful business, steady employment, and good wages.

Standard data also are the basis of many modern business controls. As an example, they provide an accurate basis for determining production costs. Unless management has some accurate measurement of the cost of the work performed in the actual production of castings, it can't determine what selling prices should be to meet competition and achieve a fair profit. Standard data also are used to plan production schedules and plant operations.

All the points brought out here indicate one general conclusion. Benefits to both employees and

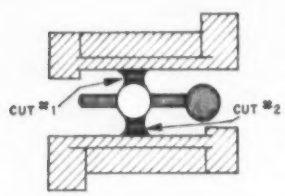


Fig. 1—Two castings with the connecting sprues attached

TABLE I—Timing an Operation

Element of Work	Average Observed Time
1. Pick up and position castings and sprue pieces for cutting	0.089
2. Cut first casting from sprues	.031
3. Aside first casting to container and turn second casting 180 degrees and position for second cut	.055
4. Cut second casting from sprues	.033
5. Aside second casting to container and sprues to scrap bucket	.023

On this same sheet of paper the time study engineer describes the operation, including type of machine, size of equipment, customer job number, etc.

TABLE II—Leveling Operator Performance

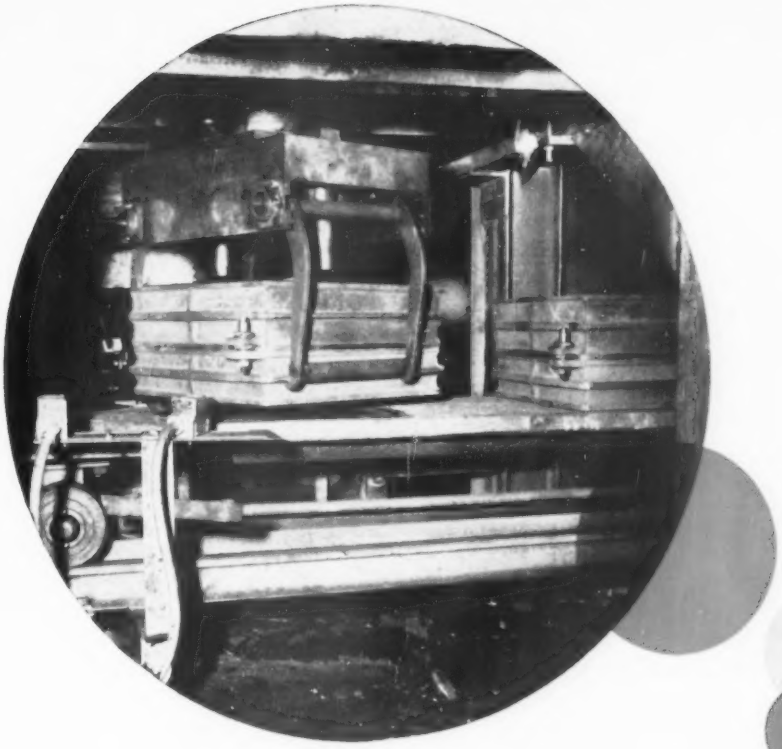
Element of Work	Average Observed Time	Performance Rating (Leveling)*	Levelled Time
1. Pick up and position castings and sprue pieces for cutting	.089	105%	.094
2. Cut first casting from sprue	.031	100	.031
3. Aside first casting to container and turn second casting 180° and position for second cut	.055	95	.052
4. Cut second casting from sprues	.033	100	.033
5. Aside second casting to container and sprues to scrap bucket	.023	90	.021

*In this instance, 100 per cent is considered normal incentive effort

TABLE III—Determining Standard Time Values

Element of Work	The Variable	Standard Data Time Value
1. Pick up and position casting and sprue pieces for cutting	Weight 21.2 lb	.095
2. Cut first casting from sprues	Constant	.032
3. Aside first casting to container and turn second casting 180 degrees and position for second cut	Distance 4 in.	.051
4. Cut second casting from sprues	Constant	.032
5. Aside second casting to container and sprues to scrap bucket	Constant	.021
Total Element Time		.231

The time required to perform this operation is determined from the Standard Data Book without having to use a stopwatch to time the operation



EFFICIENT, LOW-COST AIR CLEANING AT FOUNDRY SHAKEOUT . . .

JOY MICRODYNE

A modern foundry in upper Wisconsin had a serious dust problem in the automatic shakeout area. And they had no room in which to install a conventional dust collector.

The solution was a 12,000 cfm Joy Microdyne dust collector. Extremely compact and highly efficient, the Microdyne was mounted in a castings cooling tunnel and permitted to discharge directly into the tunnel.

Foundry management reports that the entire installation was fast and low in cost. All dust problems around the shakeout center have been eliminated. Operation and maintenance costs have been almost negligible.

The Joy Microdyne is a new kind of dust collector, 1/10 to 1/20 the size of any other collector. It collects over 99% of common foundry dusts by particle count. If *your* operation has a dust problem, find out more about the Joy Microdyne. Single unit capacities up to 64,000 cfm. Write for Bulletin 346-13.

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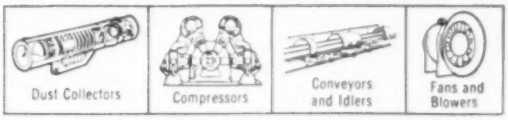

JOY

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management result from getting the facts. The facts start with the small time elements recorded on the time studies. The facts are in time, and time is the basis of all industrial operations. The key to more efficient plant operations and greater earnings of real wages is the wise use of this time. It was for this reason that Belle City Malleable and Racine Steel built their wage incentives program around a standard data plan.

Establish Operating Procedures—The starting point is the establishment of operating procedures. There must be a step-by-step procedure for performing the operation. A standard piecework rate requires a standard procedure. The rate could not be fair or accurate if one man performed the operation one way and someone else performed it another way.

It makes sense to look for the simplest and quickest way of getting the operation done, still maintaining a high level of quality. It's the only way to beat competition. There are many reasons for finding the best method on any operation. One is that it helps to assure quality.

For example, it may be determined that one type of mold is made best by jolting it three times. This procedure should be followed time after time to maintain uniform quality. Once the procedure has been determined, it should be recorded on a standard rate sheet. From then on, it is known exactly how to perform the operation the next time the job runs.

Another reason for finding the best method is to eliminate wasted motions. This accomplishment helps to establish a smooth rhythm for the operation, thus cutting down fatigue and increasing efficiency. It's also safer to use the best method, for unnecessary and awkward movements can lead to accidents.

When the procedure has been determined, the time study engineer is called in to observe how much time the operation takes.

Timing an Operation — A time study engineer breaks the procedure down into basic work motions, or elements. Using a stopwatch which records time in hundredths of a minute, he makes a record of how long it takes to perform the elements in sequence—that is, to complete the operation cycle. On a form designed for the type of operation he's observing, the engineer records the stopwatch reading after each element of the operation has been performed.

To explain this procedure, let's say that the operator is cutting two castings from the connecting sprues with a machine cutter. Fig. 1 shows the two castings with sprues attached. The time study engineer's observation of time would be indicated by something like the data shown in Table I.

Leveling the Operator's Performance—It should be recognized that some people just naturally are faster, more efficient workers than others. Some operators perform below normal and others are so efficient and skilled that they perform above normal. In addition, an operator may vary in his performance during any one time study. He may be sluggish, or he may be feel-

(*Please turn to Page* 145)

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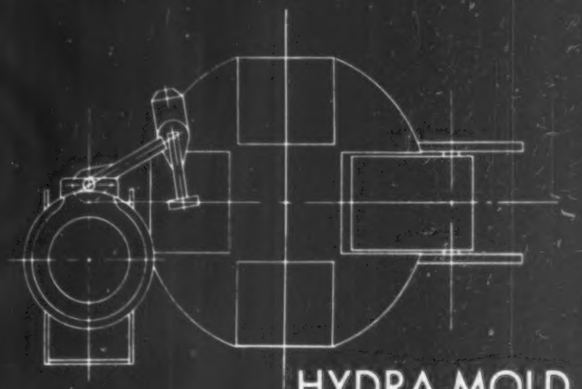
Circle 631 on Page 53→



HYDRA-MOLD

Learn About Your Stake in B&P Research

Shown here is the Rol-A-Draw station of the new 9,000 lb. Hydra-Mold unit installed at the Atlas Foundry & Machine Company at Tacoma, Washington. Hydra-Slinger-rammed mold sections weighing up to 9,000 lbs. are rolled over directly from the Roto-Mold turntable (see drawing) and patterns are precisely drawn. Then patterns are returned directly to the table ready for the next molding cycle. Four patterns are handled on the Hydra-Mold at the same time, and changes may be made without interrupting operations.

The all-hydraulic operation of the Hydra-Slinger, Roto-Mold turntable and Rol-A-Draw machine is extremely fast and accurate. New, intersecting, Roto-Mold Rol-A-Draw design completely eliminates the movement of rammed molds into the Rol-A-Draw and the movement of patterns from the Rol-A-Draw to the turntable. Four men handle the entire operation on the Atlas unit, although that manning can be changed to meet production requirements without affecting efficiency.

The complete Atlas story is told in the current issue of BETTER METHODS magazine; ask for your free copy. Beardsley & Piper Div., Pettibone Mulliken Corporation, 2424 North Cicero Avenue, Chicago 39, Illinois.

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Sure I'm interested in your research and its results! Send me the whole story on:*

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BIG NEWS FROM B&P

A NEW ALL-HYDRAULIC MOLDING UNIT WITH SERIES H ROL-A-DRAW

occupies LITTLE space . . . does BIG things

The need existed; foundrymen everywhere wanted an easy-to-operate, easy-to-install, complete molding unit with *real flexibility and capacity*. B&P engineers went to work on the problem. The result was the new HYDRA-MOLD with all-hydraulic Roto-Mold turntable, Hydra-Slinger and Rol-A-Draw. It provides everything foundrymen wanted . . . and more.

Have space problems? A complete unit with 15,000 lb. capacity requires only 18 x 31 feet.

Need flexibility? The largest Hydra-Mold handles molds or core boxes up to 54 x 90 inches—draws to 28 inches. Instant pattern changes!

Need productivity? A single Hydra-Mold provides the production of four big fully-rigged machine stations at a fraction of the installation and operating cost.

Worried about costs? Hydra-Mold manning may be varied to meet the level of operation without loss of efficiency . . . costs kept in line over a wide range of capacity conditions.

All this and *low, low installation costs, too!* No pits required—single sand delivery system—no pattern or flask changeover—single, simple mold and flask conveyor system and many other advantages.

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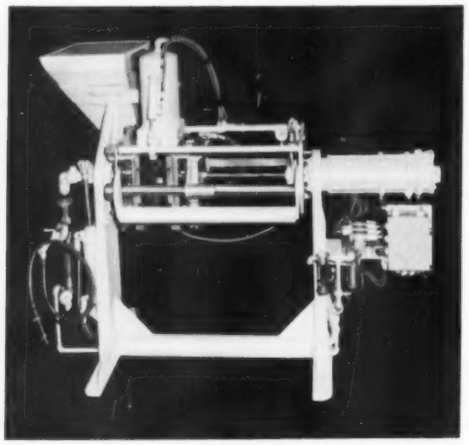
AND THAT'S NOT ALL! LOOK AT THESE MAJOR NEW DEVELOPMENTS . . .

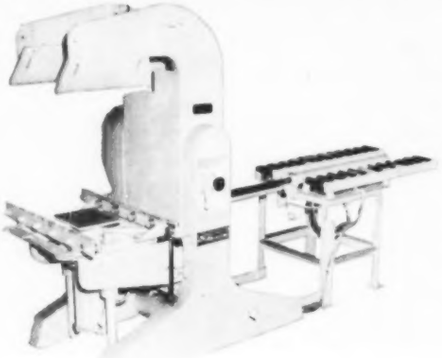
Shell Core Units That Really Shell Out!



Speaking of shell cores, the new SF-6A CORMATIC Hollow Shell Core Machines deliver fully cured, ready-to-use, precise cores at lower cost than any other available units. A push-button-operated, completely automatic version, the SF-6A, is the most productive single-station unit yet developed. Both are results of B&P's intensive research and development program.

One man easily operates three of the automatic units to provide truly outstanding production at a fraction of the investment for similar productivity with other methods. Not only that, but with three single-station machines, three different size cores with different production time cycles can be produced at top efficiency. No necessity to slow the whole operation because one core requires a longer baking cycle. Box changes or maintenance can be accomplished on one unit at a time, without affecting the high production rate on the other units. More flexibility to meet varying production requirements, too.

A New Core Rollover Machine That Rolls Up New Records!



Here's the rollover-draw machine to keep pace with the highly productive FLEXIBLO and SAN-BLO core blowers (and other core production units). The NCR ROL-A-COR, available in three sizes with capacity to 1,000 lbs., is assurance that modern core blowers work at most productive rates. The NCR ROL-A-COR not only speeds handling of cores, but provides an extremely accurate draw, rolls over and ejects. It will handle any box within its broad range without clumsy, time consuming machine adjustments, too.

A New CO_2 Unit That Takes the Guessing Out of Gassing!

This operator is producing *completely cured CO_2 cores* at an oil-sand core production rate. How?—the new FLEXIGAS core gassing machines! Two FG-5-10 FLEXIGAS machines provide a balanced operation when teamed with the highly productive CB5 FLEXIBLO core blower.

FLEXIGAS core gassing machines feature automatic gassing cycle, full 4" clamping stroke and simple push button operation.

Now, whatever your requirements may be, with a very modest investment, you can use the CO_2 process on a *real* production basis.

Use this card to learn about your stake in B & P research

(*Continued from Page 140*)
ing particularly ambitious and be stepping on it. He also may be a little nervous about having a time study engineer looking over his shoulder.

These variations in performance will be taken care of by the time study engineer's rating of the operators' performances. This step is called *leveling*. The time study engineer is trained to obtain a time that will be fair to the normal operators who later will perform the operation.

As a result of this rating, the study on the machine cutting operation will be amplified by the information shown in Table II.

Determining Standard Time Values—At this point we have gone through all the procedure which the time study engineer performs when he's observing the operation. Now the pencil work begins. He has to analyze what he's recorded by comparing this information with data previously accumulated.

In his analysis he determines whether the elements in the operation he's observing are *constants* or *variables*. A constant element is one which takes the same amount of time to perform, regardless of the operation. A variable element is one which takes different times to perform because dimensions and weights vary.

The time study engineer does not try to compare apples with oranges. He fits together a number of the studies taken of similar operations until he has the equivalent of a *master study*. The times allowed for constant elements should be the same in all incentive standards. The times allowed for variables should be in proper ratio to similar element times. The time study engineer plots a great deal of information on comparison sheets and graphs to determine standard time values for elements.

These standard time values, along with the descriptions of the work elements and sketches of workplaces, then are recorded in a Standard Data Book.

Once the time values of the elements have been recorded in the Standard Data Book, they are used thereafter to determine the time to perform many operations. The time values are not changed unless there is a change in tools, equipment, method, etc., as recorded in the element descriptions.

In the case of the machine cutting operation it is necessary to know the weight of the castings and sprue pieces and the distance the casting is moved to make the turn and position the part for the second cut. In the example, let's make the weight 21.2 lb and the distance 4 in. Table III shows this information.

Provide for Delays—Neither man nor machine can keep up a steady, unbroken pace. Men tire and machines break down. In the best run departments, certain delays and interruptions limit output. In the computation of a piecework rate, allowances are made for such delays and interruptions.

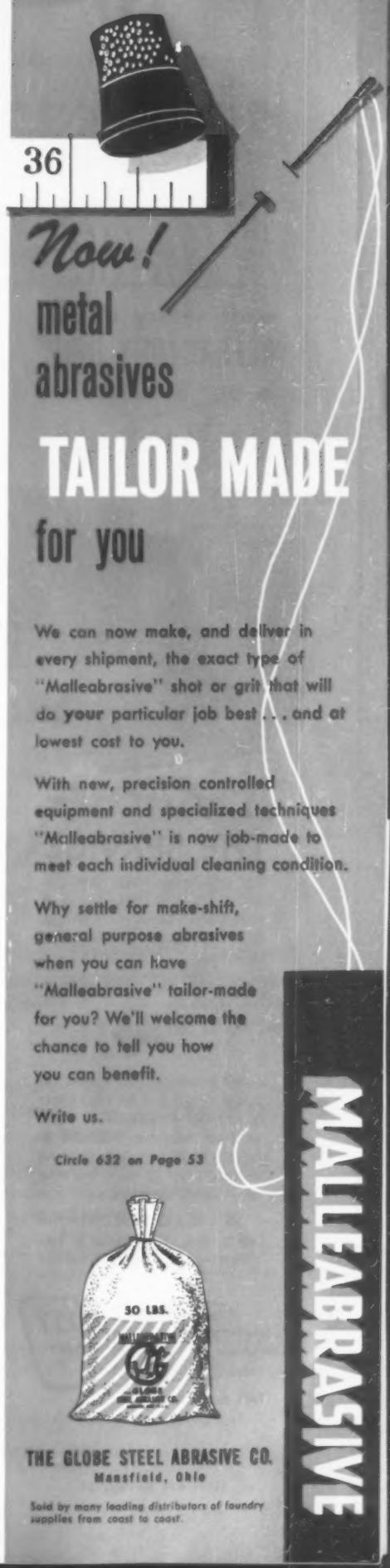
Although these studies try to minimize fatigue by finding the best method of performing the operation, everyone needs to relax occasionally during the work day and take care of his personal comfort. These needs also are accounted for in the allowances.

As a part of the incentives program, there must be a procedure for the employee to follow when he is not producing. At Belle City Malleable and Racine Steel, dispatcher-timekeepers are stationed conveniently in booths in the plant. If an operator believes that he will be off production more than the paid allowable time of one-tenth hour, or six minutes, there is a correct procedure to follow.

He should go to the dispatcher-timekeeper's booth and record his time off production. When he is ready to resume production, he again records the time at the dispatcher-timekeeper's booth. This procedure provides a proper distribution of his time for incentive pay.

Determine the Piecework Rate—When the standard time values have been set, it is possible to determine the piecework rate. This rate is stated in terms of 100 units (molds, cores, etc.) of production. The formula for determining it looks like this: (Timing Rate ÷ 60 minutes) × Units × Standard Time = Piecework Rate per 100 Units. An operator's earnings can be figured by multiplying his production (in 100 units) by the piecework rate.

A copy of the piecework rate sheet is placed conveniently at the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Why settle for make-shift, general purpose abrasives when you can have "Malleabrasive" tailor-made for you? We'll welcome the chance to tell you how you can benefit.
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Tough, new STEEL-LINE ends worry about "REFRACTORY DRIP" in our 3100° ladles

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TWICE THE SERVICE

from ladle linings means lower production cost and higher quality in electric steel castings. "Afternoon Boss" Gayle Shiffler gets real satisfaction with 2" of new high-alumina

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SEE STEEL-LINE IN ACTION in your foundry. Write or call Ironton to make arrangements for proof of performance.

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operator's work station whenever he performs an operation. He then has available to him a description of the part, the elements he is to perform, the total element time, the time added for allowances, the total standard time, the timing rate, and the piecework rate.

This article has concentrated on showing how the standard data plan works. Many employees at Belle City Malleable and Racine Steel are on other plans, such as the daywork plus premium plans, group incentive plans, and plans where the stopwatch is used exclusively to set piecework rates. Together they make up the total incentives program.

All of the wage incentives plans are based on the principle that, wherever possible, the employee should have an opportunity to increase his earnings through his own effort and skill. He is rewarded for any output which is more than is normally expected. At the same time, the program works to make his company grow and to make his job more secure by helping to control costs and expand productive capacity.

Results of Incentive Plans

A study of 2500 wage incentive installations in 29 different industries showed that productivity increased an average of 63.5 per cent, employee earnings rose an average of 20.6 per cent, and an average saving in unit labor costs of 25.9 per cent was effected.

This survey was conducted by John D. Dale, president, the George Elliott Co., New York management consulting firm. The plans studied were those installed by 17 management consulting organizations.

Productivity gains ranged from 39 per cent for automobiles and automotive equipment to 100 per cent for tobacco manufacture. Foundries showed a 71 per cent increase, also a gain of 29.5 per cent in employee earnings and a reduction of 33 per cent in unit labor costs.

Editor's Note: This article appeared originally in "Foundryways," published by the Belle City Malleable Iron Co. and Racine Steel Castings Co., Racine, Wis., and is reproduced here with the permission of those companies.

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60% more output . . . for $3000 Dividend Dollars/year.

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25% more output . . . for $1250 Dividend Dollars/year.

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25% more output . . . for $1250 Dividend Dollars/year.

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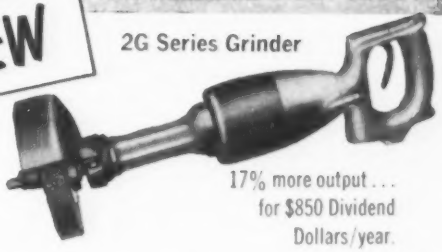

17% more output . . . for $850 Dividend Dollars/year.

If your operators are using older model grinders, you can increase their man-hour productivity by as much as $3000 Payroll Dollars in one year, just by replacing the older tools with one of the new I-R designs.

Multiply these *Annual Dividends* by the number of grinder operators in your plant, and you can see why management today is taking a new look at portable tool operations.

There's a fast, easy way to calculate the amount of *Dividend on Payroll Dollars* these new I-R grinders can help you earn in just one year—without adding to your present payroll.

It's yours without obligation. To get it, call your I-R AIRengineer today. Or write Ingersoll-Rand, 11 Broadway, New York 4, N. Y.

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Tools plus AIRengineering increase output per man

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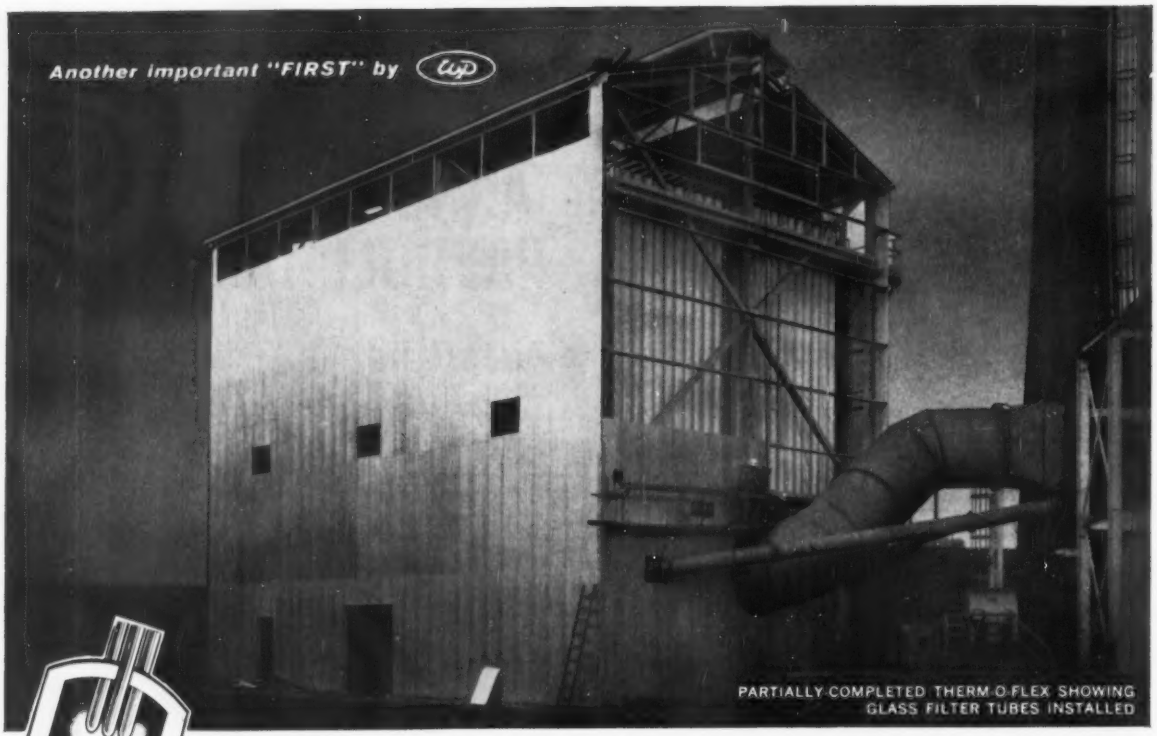

PARTIALLY-COMPLETED THERM-O-FLEX SHOWING GLASS FILTER TUBES INSTALLED

To Clean Electric Furnace Fumes To 550° F

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SELECTS **THERM-O-FLEX** GLASS FILTERS!

SELECTION MADE AFTER EXTENSIVE PILOT PLANT STUDIES PROVED "THERM-O-FLEX" ADVANTAGES

To insure clean gas emission from two 100 ton electric furnace operations at its West Seattle plant, Bethlehem Pacific Coast Steel Corporation has installed a Western Precipitation "Therm-O-Flex" Hi-Temperature Filter system—*the filter system featuring silicone-treated glass bags that efficiently clean gases as hot as 550°F!*

This is the first steel plant installation in the West to use glass bag filters for cleaning electric furnace emissions, the installation being made only after an exhaustive pilot plant study by Bethlehem Pacific engineers. Subsequent operation of the full size installation has clearly substantiated the pilot plant results and has demonstrated the unusually high collection efficiency of "Therm-O-Flex" equipment on this type of application.

No Shaking Required

In addition to their ability to handle unusually hot gases, the specially-treated woven glass filters of the "Therm-O-Flex" permit the filter units to be easily cleaned by simply collapsing the bags. *No destructive shaking processes are required.*

Furthermore, the large diameter filter tubes (12″ in diameter) provide more efficient cleaning of the collected material on each collapsing cycle—another operating advantage engineered into each "Therm-O-Flex" installation by Western Precipitation dust control "know-how."

"Therm-O-Flex" is one of six types of gas cleaning equipment offered by Western Precipitation—"Cottrell" Electrostatic Precipitators, "Multiclone" Centrifugal Collectors, "CMP" Combination Multiclone-Precipitator units, "Therm-O-Flex" Hi-Temp Filters, "Dualaire" Jet-Cleaned Filters, and "Turbulaire-Doyle" Scrubbers. No other organization provides such wide range dust collection experience—no other offers such unbiased recommendations to fit the requirements of your particular operations. You simplify your gas-cleaning problems by bringing them to Western Precipitation.

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Foundry Developments

By EDWIN BREMER

Metallurgical Editor

Shakes Out Gas

ELIMINATION of porosity, improvement in quality, and increase of surface quality of aluminum and zinc die castings through use of ultrasonics is indicated by experiments being conducted by American Charcoal Co., Detroit. Gas inclusions are said to be eliminated, resulting in increased tensile and yield strengths, and solidification is accelerated. Through extensive experimentation it was found that a transverse sonic wave produced the desired results and entrapped gases were emitted at the node of the wave. By modifying mold design to incorporate special bleeders at the points indicated, a dense, porosity-free casting resulted. According to American Charcoal, ultrasonic generators and transducers can be attached readily to present diecasting and permanent mold equipment.

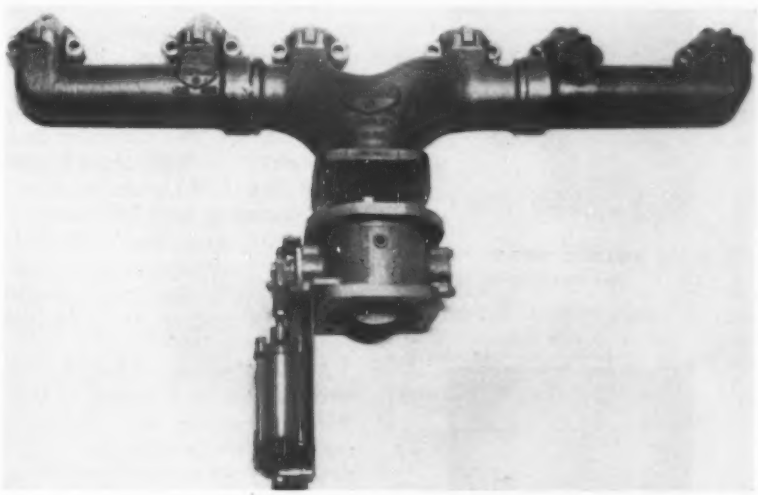
Sound Steel Castings

INVESTIGATION to develop new founding methods for age-hardenable austenitic steel castings is described in a report, "Foundry Characteristics of Mn-V-Mo Age-hardening Austenitic Steel," by Howells and Lange. Castings were poured at 2800° F using a gating system with a choke at the sprue base, an enlarged runner bar, and an ingate entering the riser. Since the alloy appears more difficult to feed than low-alloy steel, precautions should be taken in choosing gate and riser dimensions.

Sand mixtures differing from conventional mixtures were required to prevent mold-metal reactions. Mixtures with a zircon sand base containing 5 per cent silica sand and 1 per cent case oil as special additives gave high-quality casting surfaces. Tensile properties of the alloy were controlled by the aging phase of heat treatment, and 145,000 psi tensile, 110,000 psi yield strength, and 12 per cent elongation were attained with aging at 1300° F for 8 hours. Details are available in the report designated PB 151539 which may be obtained from the Office of Technical Services, U. S. Department of Commerce, Washington 25, for 50 cents.

Engine Does Braking

UNUSUAL braking device employing the power of exhaust gases from internal combustion engines is said to provide smooth and rapid deceleration of heavily loaded trucks, and aid in abolishing the runaway vehicle that has lost its air brakes. The device shown in the lower portion of the accompanying illustration employs a butterfly valve which closes to build up back pressure in the manifold, and in turn on the pistons of the engine. Movement of the valve is actuated by the cylinder at the left, and controlled by the operator of the vehicle through a hand lever. Monitoring is accomplished from a panel-mounted gage measuring the manifold pressure. Braking unit is made of heat-resisting stainless steel to withstand the high temperatures of the exhaust gases, and is a development of Power Brake Equipment Co., Portland, Oreg. Exhaust manifold shown in the illustration also is constructed of stainless steel. It is claimed that use of this braking unit saves the air brakes for complete stops, and eases wear and tear on bearings, rods, wrist pins, and bearing cap bolts during deceleration. Pressurizing cylinders on deceleration also reduces oil consumption.



Studies Phosphorus Effect

INVESTIGATION on "The Effect of Phosphorus on the Mechanical Properties of Flake Graphite Cast Iron" by G. N. J. Gilbert and reported in the June, 1959, issue of *B.C.I.R.A. Journal* (Birmingham, England), indicates that phosphorus up to about 0.8 per cent increases tensile strength and that is associated with a decrease in eutectic cell size. Brinell hardness is increased by approximately 40 points with 1 per cent phosphorus. Generally accepted relationship between tensile strength, hardness, modulus of elasticity, and chemical composition requires modification to account for the effect of phosphorus. Though phosphorus modifies the stress-strain properties and, in particular, reduces the degree of recoverable strain on unloading, it does not affect the modulus of elasticity of cast iron which defines the truly elastic deformation which occurs in the matrix.

By JACK C. MISKE
Associate Editor

Members See

HIGHER OUTPUT . . . TECHNICAL PROGRESS

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Doehler Award Winner

● OPTIMISM was the keynote of the 1959 annual meeting of the American Die Casting Institute, held Sept. 16-17 at the Edgewater Beach Hotel, Chicago.

The 125 job-shop diecasters who make up ADCI's membership were happy for at least two reasons. First, they felt that by the end of 1959, use of diecastings will have resumed the steady growth which was interrupted by the 1957-58 business recession. Second, they heard reports on new developments which they feel will do a great deal to improve the efficiency—and thereby the volume—of diecasting production.

ADCI estimates that with passenger car production of 6.5 million units and without further labor problems, the zinc diecasting total may reach 310,000 tons (58,000 more than 1958) and the aluminum diecasting total 390,000,000 lb (99,750,000 more than in 1958). In addition, the institute states, all indications point to steadily higher levels of diecasting output in both metals during 1960.

ADCI Programs—First sessions were devoted to a review of institute and industry accomplishments and to plans to expand basic ADCI programs. The latter include the group's "Product Standards for Die Castings," which helps buyers to design and purchase die castings at the most economic levels possible, and the Certified Zinc Alloy Plan, which is designed to assure that buyers obtain zinc diecastings with maximum physical properties.

During the first afternoon, Victor D. Sweeney, Metal Pumping Services Inc., described new methods of metal transfer in diecasting plants, and a panel discussed varying aspects of "Planned Marketing of Diecastings." Panel members and their subjects included the following: H. W. Bollman, Newton - New Haven Co., "Maintaining an Aggressive Sales Force"; S. A. Gullo, Chicago White Metal Casting Co., "Selling Diecastings with the Printed Word"; Alfred Schneier Jr., Advance Pressure Castings Inc., "Using all the ADCI Tools at Your Disposal"; and W. E. Brown, Kiowa Corp., "Getting Full Value from Your ADCI Affiliation."

Second-day sessions were devoted exclusively to activities of the institute's research arm, the Die Casting Research Foundation.

DCRF Projects — The development of improved die materials was the basic DCRF program, and the theoretical phase of this work was completed for the foundation at Battelle Memorial Institute during the last year. A basic equation has been developed which relates variables of the process to the heat checking of diecasting die steels. This achievement is believed to be a significant step in advancing the application of diecasting techniques to higher melting point alloys.

Exploration of die materials led the foundation into corollary activities which included the development of improved core materials. This work has revealed that molybdenum offers unusual properties as a core material because of its remarkable resistance to heat checking (FOUNDRY, July, 1959, p. 136).

During the last year, DCRF started a new project to study the principles of metal flow in diecasting dies; it is recognized that many

"Bakeless" cores and molds in 20 seconds

Liquid Carbonic's Improved CO_2 Process Sparks Revolutionary Advances in Core-Hardening

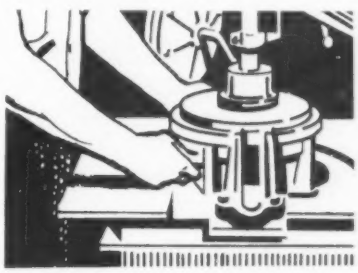
Requests for "we-need-it-tomorrow" deliveries seem to cram a foreman's order pad every day. Until now, immediate delivery has been a source of concern to the foundry industry because of lengthy baking and drying procedures.

Because of this, more and more foundries are adopting the bakeless CO_2 core-hardening process. Intricate cores can be made with CO_2 in a matter of seconds; completely finished cores (rammed, gas-hardened and removed) are produced in less than three minutes. Thus, CO_2 has become the propelling ingredient in production boosts throughout the country—so much so that it promises to soon become *the* method of core-hardening.

Speed . . . And Other Advantages

Actually, it's simply a matter of supply and demand: the great demand today is for speed—therefore, CO_2. It doesn't just end there . . . the CO_2 process makes other core-making techniques old-fashioned. For example:

1. Eliminates baking ovens and core dryers
2. Better dimensional stability
3. Smoother finish on castings
4. Excellent shakeout and collapsibility
5. Reduces production costs
6. Minimizes rejects
7. Eliminates excessive core inventory
8. Expedites emergency orders
9. Simplifies core design
10. Adaptable for automation



CO_2 Ideal for Mold-Hardening, Too

In addition to these advantages, many foundries have discovered that CO_2 is just as beneficial in mold-making as it is in core-hardening. Dry sand molds sometimes require baking at 300° to 400° F. for periods up to 75 hours; the CO_2 process can do the same job at time-savings up to 95%. CO_2 molding also can save as much as 90% in machine-shop costs, cuts labor requirements, and works equally well on both large- and small-size molds.

Although CO_2 is a relative newcomer to core-making, many improvements have already been made

since it was first introduced. A trained staff of Liquid Carbonic engineers have been working for years to improve the CO_2 process. The combination of research, development, and daily shop practice has brought the CO_2 process up to today's high standards, making it the preferred method of core- and mold-hardening in today's foresighted foundries. Call your Liquid Carbonic representative today and have him show you how CO_2 can improve your production!

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variables in diecasting production stem from a lack of full understanding of the behavior of metal as it fills a die cavity. A co-operative project with related research groups to sponsor this program now is under joint consideration.

The foundation also announced development of a compatible vacuum casting method designed to meet the needs of jobbing diecasters. It includes alternate vacuum systems which can be used on either zinc or cold chamber diecasting units and can be adapted to new or existing dies with minimum expense.

JAMES E. FITZPATRICK
Scholarship Award Winner

These systems permit continuous evacuation of the die cavity during filling of the die and provide for positive shutoff of metal flow from atmospheric pressure during evacuation. New vent blocking devices are said to change basic venting concepts radically.

Other activities under investigation by DCRF task groups include the evaluation of commercial vacuum diecasting systems, die lubrication problems, die temperature control, and cast dies and tools.

Educational Program—Expansion of the institute's diecasting educational program also was proposed to the group. The initial work now is in its third year at Pennsylvania State University, and its success has determined the basis for similar programs at other engineering schools. At Penn State, students in the foundry and machine shop production courses are offered lecture and laboratory sessions with academic credit. At these sessions, students have access to an operating diecasting machine and visual teaching aids, all supplied by ADCI member companies. A special diecasting clinic-exhibit is staged on campus each spring for the student chapters of engineering societies.

A similar program is being started at California State Polytechnic College under the guidance of Pacific Coast Group ADCI members. Selection of additional engineering schools in the midwest and central portions of the country also will be announced soon. The institute believes that these activities will attract new engineering talent into the diecasting industry and will insure that young engineers going into all branches of industry will have fundamental knowledge of diecastings.

As part of the Penn State program, Eastern Regional Group ADCI members provide an annual scholarship for a deserving student and cash prize awards for outstanding papers on the subject of diecastings. The scholarship this year was awarded to James E. Fitzpatrick, a mechanical engineering student, who earned consideration with a paper on "Essential Factors in Diecasting Design." An additional scholarship will be awarded to a summer session student.

Officers Elected — Gordon C. Curry, Dollin Corp., was elected president of the institute for the 1960 term, and Walter E. Brown, Kiowa Corp., was elected vice president. David Laine and W. J. Parker, ADCI, were re-elected secretary and treasurer, respectively.

Members of the national board of directors elected by the group's four regional groups include Harry J. Marcks, C. M. Grey Industries Inc., eastern regional group; H. H. Weiss, Superior Die Casting Co., central regional group; F. C. Bennett, Dow Metal Products Co., division of Dow Chemical Co., midwestern regional group; and Paul T. Harlow, Rangers Die Casting Co., Pacific Coast regional group.

Directors-at-large are F. W. Burgie, Doehler-Jarvis Div., National Lead Co.; R. R. Dreibus, Harvill Corp.; Alfred Schneier Jr., Advance Pressure Castings Inc.; and L. G. Vanderhoof, Stewart Die Casting Div., Stewart-Warner Corp.

Chairmen of the institute's regional groups are W. F. Feil, Aluminum Co. of America, eastern regional group; Norman Dress, Ains-

A Salute to the Men of the Great Foundry Industry...

THE skill and experience of the foundry Melter are a vital part of every gray iron casting. For it is his responsibility to control the performance of the cupola to precisely meet pre determined metallurgical specifications.

From the accurate weighing and charging of materials in the cupola . . . to the careful control of such factors as coke bed depth, temperature and blast pressure, the Melter must exhibit the special skill and judgment of his unique craft.

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An enlarged (11½" x 11") reproduction of the above etching, suitable for framing, will be sent without cost upon request. Reproduction of etchings from the first advertisements of this series, featuring the Pattern Maker and Molder, are also available.

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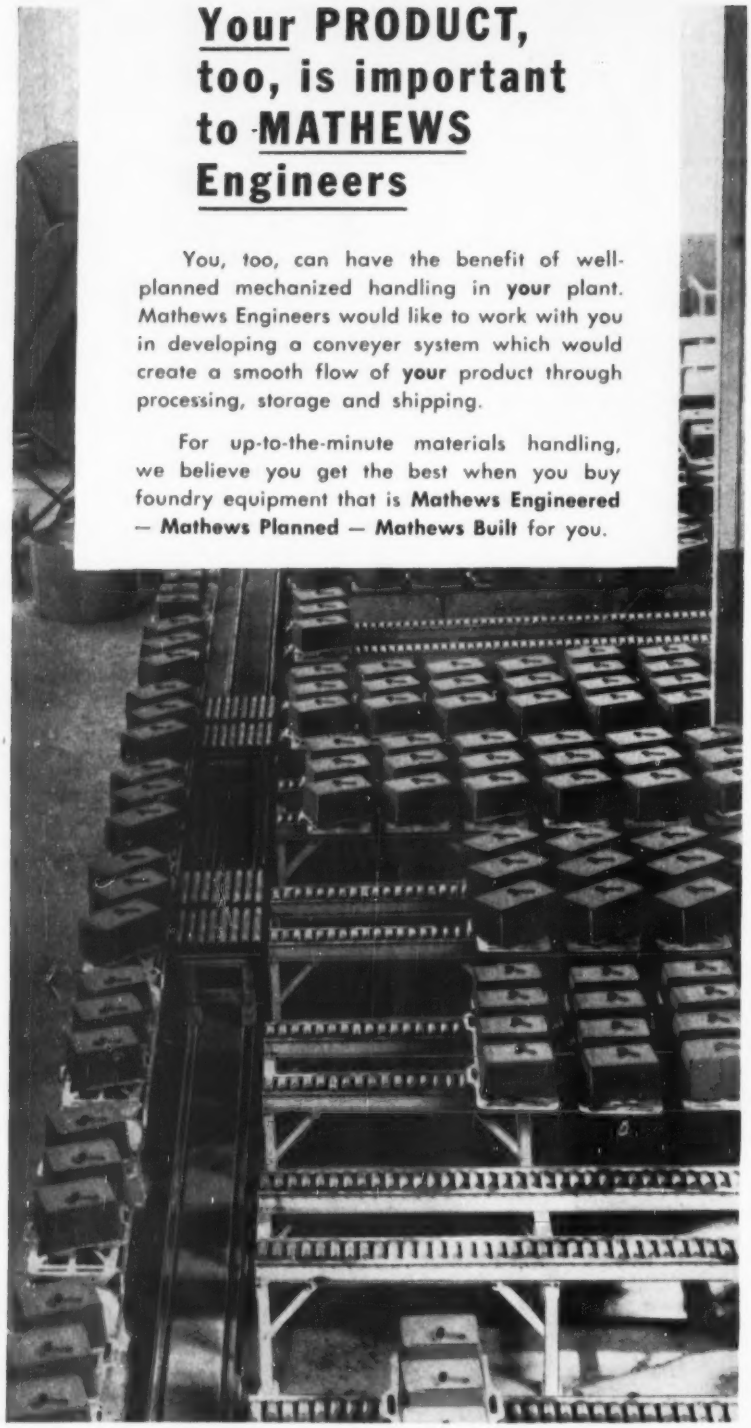

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worth Precision Castings Co., division of Harsco Corp., central regional group; F. C. Bennett, midwestern regional group; and E. M. Woods, Alumium Die Casting Co., Pacific Coast regional group.

Doehler Award — The annual Doehler Award, highest honor of the diecasting industry, was presented to Dr. Matthew A. Hunter, dean emeritus, Rensselaer Polytechnic Institute, at the society banquet. The award, which consists of a certificate, a plaque, and a cash honorarium, was presented by Walter M. Goldhamer, Superior Die Casting Co., on behalf of the institute's board of directors. Dr. Hunter has been technical consultant to the DCRF since its inception eight years ago and has guided its search for improved die materials. He is a leading authority in the field of high-temperature metallurgy.

Safety Awards — Certificates of Merit for safety were awarded to ten plants during the meeting. They included Ability Die Casting Co., Chicago; Aluminum Die Casting Co., Los Angeles; DeCardy Bros. Co., Chicago; Hoover Co., North Canton, Ohio; Madison-Kipp Corp., Madison, Wis.; Midwest Die Casting Co., Milwaukee; Stella Products Corp., Livingston, N. J.; Stewart Die Castings, division of Stewart-Warner Corp. (both the Bridgeport, Conn., and Chicago plants); and Twin City Die Castings Co., Minneapolis.

WESTERN NEW YORK: Installation of 1959-1960 officers, Western New York chapter, AFS, was held at the Sheraton Hotel, Buffalo, May 7. New officers are, standing, A. J. Heysel, E. J. Woodison Co., chairman; seated, left, E. J. O'Connell, American Radiator & Standard Sanitary Corp., vice chairman; Ronald E. Turner, Queen City Sand and Supply Co., secretary

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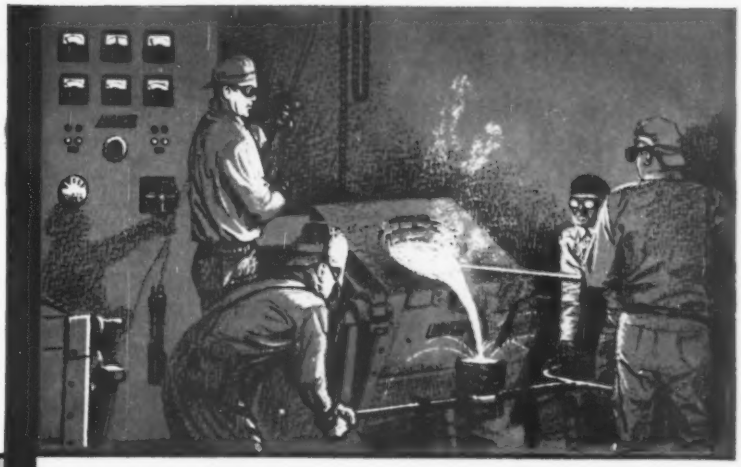

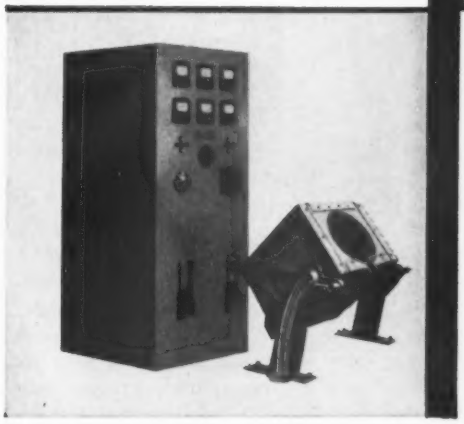

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Man to Man

By RALPH L. LEE, *President*

Lee Hobby Foundry
Birmingham, Mich.

"If we get all of the dope, we don't have to be geniuses to make sound decisions. The dope frequently makes the decision for us"

Facing Facts in the Foundry

● A SHORT TIME ago a neighboring foundry called us up at the LEE HOBBY FOUNDRY with the thought that we might be interested in a job it didn't care to tackle. I thanked the people for their neighborliness and suggested that they send the prospect out with his patterns so that we could look them over.

They turned out to be dillers, with boxes for some of the smallest and most intricate cores I had ever laid my eyes on. Some required pasting, and, as nearly as I could picture, assembling them in the mold was not only going to require a steady hand with forceps, but also nothing short of sleight of hand.

The modelmaker, obviously with no experience either at molding or patternmaking, had made the patterns all by himself, and from a modelmaking standpoint he had every reason to be proud of his job. And I could see that he was. After sizing up the whole job and explaining as diplomatically as possible the changes which would have to be made in every item before we could even make a trial run, I began to wonder about the sportsmanship of the foundry that sicked this cookie onto us.

An effort to arrive at some sort of a realistic cost estimate threw me into a tizzy. What I should have done was to tell the fellow (who, by the way, I had learned to like) that his job was a little beyond us, that he'd better look for someone else. But I didn't. The challenge of the job—sort of a saucer, cup, and spoon complex—twisted the arm of my old ego, and I said "Yes." In spite of all of negative data piled up against tackling the job, I agreed to go ahead anyway with the only possible excuse—a gamble on proving to my neighboring foundry and myself what a stemwinder I am.

Came the Dawn—After hours fiddling around revamping corebox, core mixes, and core wires; two cupola heats; and making two complete sets of castings, the last one poured at 3 o'clock in the morning, I didn't get even one good one. At this point Mother (that's Mrs. Lee now chairman of the board and administrative director) dressed in her pajamas and dressing gown, slipped into the foundry with a no-foolin' look in her eye while ultimating, "This does it. You shouldn't have taken it on in the first place. You scare me half to death, out here all by yourself at your age. Just look at you sweating. You are not going all through this again. Now get to bed."

"John is a specialist in designing small castings"

I felt like a heel when I called up my customer to tell him I was licked, apologized for my long delay, canceled charges, and wished him good luck. This project was not a total loss by any means, for I learned how to make those seemingly impossible cores, I learned how to set them, and I learned how to have more faith in my estimate of the difficulties and costs of a prospective job. But the most important thing I learned was to swallow pride and say "No" when the balance of the evidence unquestionably points in that direction.

Much can be said for taking a flier now and then on a speculative job (I guess that's what research is in moderation). But a favorable batting average in making sound business decisions has as much, if not more, to do with a profitable operation as does making sound castings. In fact, the failure to say no at the proper time has been the death of many a foundry.

The thought occurred to me that the art or science of making good decisions as practiced by the out-

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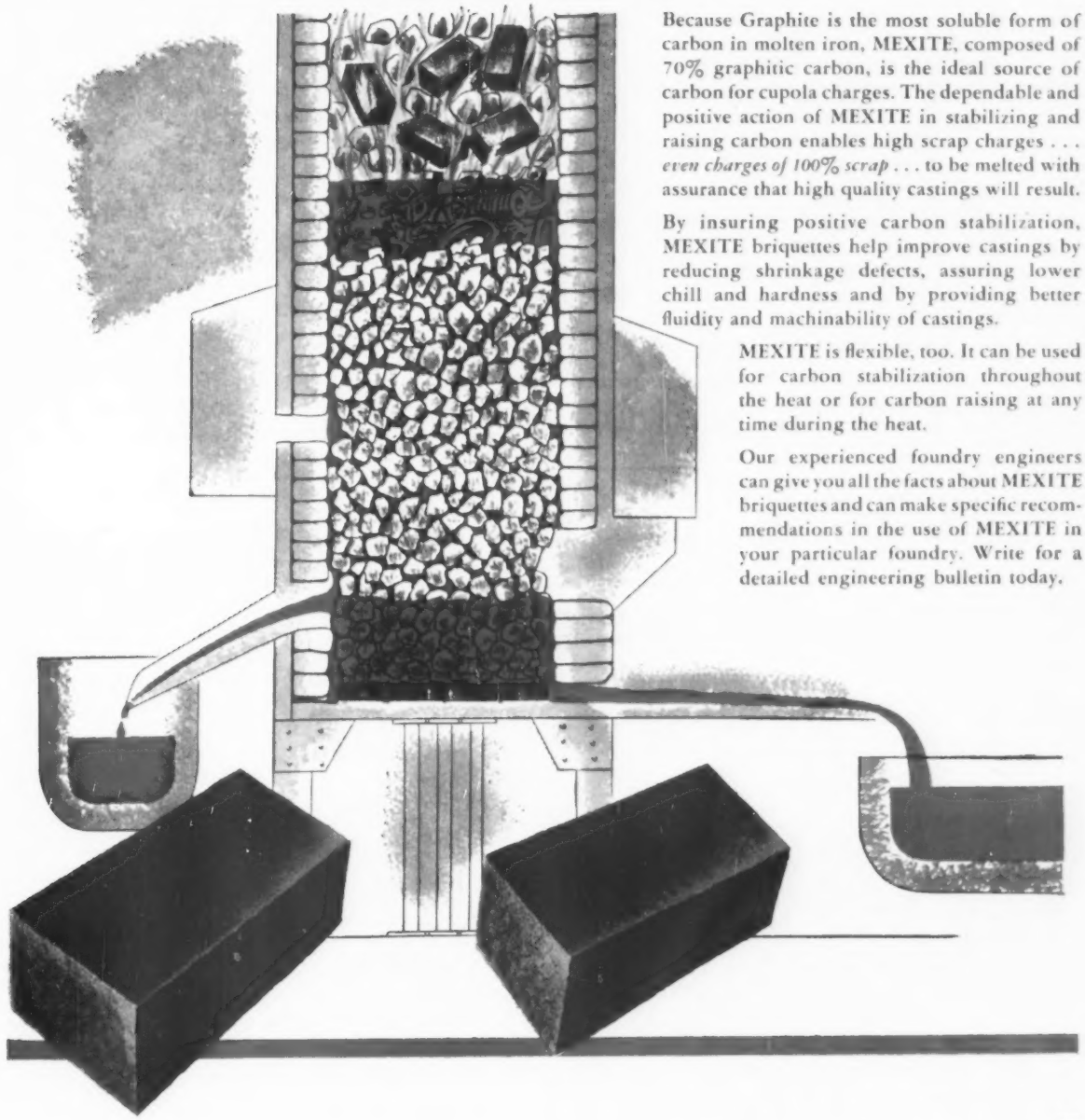

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By insuring positive carbon stabilization, MEXITE briquettes help improve castings by reducing shrinkage defects, assuring lower chill and hardness and by providing better fluidity and machinability of castings.

MEXITE is flexible, too. It can be used for carbon stabilization throughout the heat or for carbon raising at any time during the heat.

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Circle 642 on Page 53

standingly successful is rarely mentioned, let alone developed, in our textbooks and presentations on leadership and management. I was reminded of this thought on my way to the railroad station this past week as I passed one of those huge electric signs that spell out a whole series of different advertising messages, one after another.

Just how many light bulbs have to be in each rectangle where any letter in the alphabet or any number must appear, I have no way of knowing. But this I do know. There is an irreducible minimum which must be provided if all of the letters and numbers are to be definitely recognizable. Each one of these necessary light bulbs can either be on or off. Each one can either say yes (on) or no (off). No dilly-dallying.

A Minimum Number — Now here's the thought I had: Any problem seeking a solution is composed of a minimum number of bits (like bulbs) of information. Either positive or negative (bulb on or off). If an effort is made to solve a problem or make a decision with less than the minimum number of bits required, that decision is bound to be a gamble, like shooting dice or tossing a coin.

On this same trip, sitting in the office of an old friend, manager of a large General Motors plant, and discussing this decision business with him, I saw the bit principle in operation. We were interrupted three times by callers.

The first fellow came in and told his story in very few words. The Boss thought a moment, nodded his head, and dismissed his caller with a salute and a smile. The next fellow did just as good a job of stating his case as the first one, but the Boss, after wrinkling the brow a bit, shook his head and said "Don't you think so, John?" The fellow left with a smile, nodding his head.

The third one of them was the wordiest of the three. He hemmed and hawed quite a bit. The Boss said, "Maybe we'd better get together in the morning. Don't you think so?"

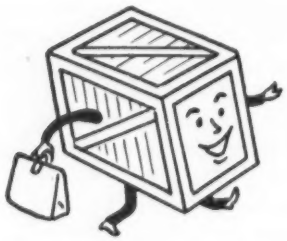
Have All Your Bits

Turning to me, he said with a smile, "Doc, I guess this last fellow didn't have all of his bits about him." It was my turn to nod.

Of course, we can't always wait for all the bits, particularly when we don't know what the minimum number is. In emergencies, hunches might have to be used as supplements, but getting into the habit of going off half cocked to show how brilliant we are is likely to give us too poor a batting average for success in management, even though we have with luck made a few home runs.

For the long haul, it seems that successful deciders usually keep their shirts on, get all of the dope, and have the knack of recognizing it when they get it. I've been told by some of the most outstanding among them that if we get all of the dope, we don't have to be geniuses to make sound decisions. The dope frequently speaks up so loudly for itself that it makes the decision for us.

So the moral is, I guess, "Let's have all of our bits about us before we decide."



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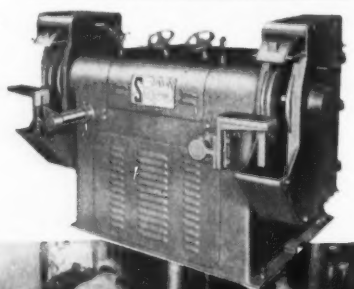

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A large midwestern grey iron foundry finds that:

*"Cores made with Dexocor baked through in 40 to 50 per cent less time—saving fuel dollars and permitting more flexible production scheduling. In addition, green cores, even with high stands or overhang, held perfect shape. Cracking of cores, gas defects and metal penetration were virtually eliminated."

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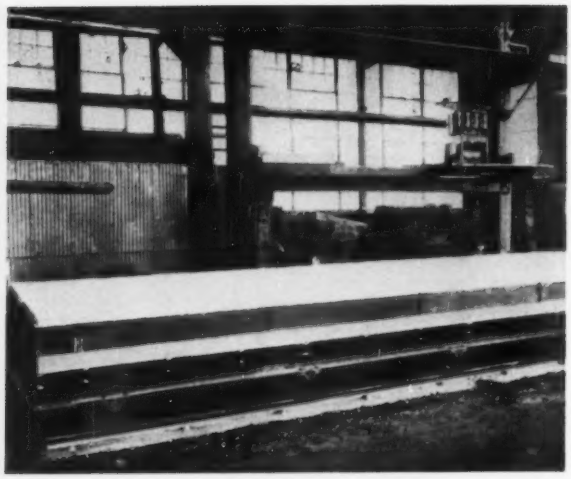
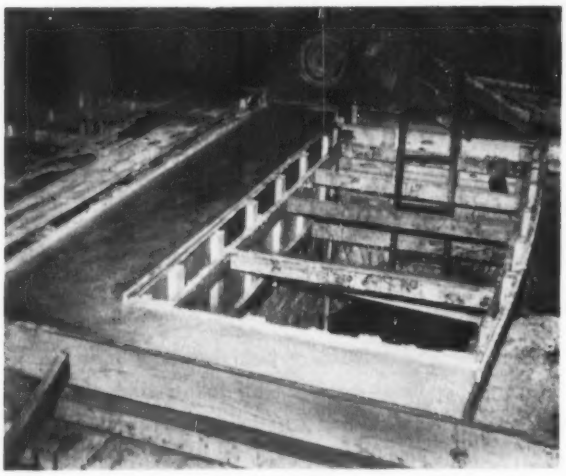
In this stress-relieving furnace, B&W Kaocrete-D is used on the floor ledges, car top, in the door jamb and at the end of the flat roof where it withstands the abrasion of the door. This material is specially designed to withstand severe abrasive conditions and mechanical abuse.



Heavy duty car top service requires a high strength castable. B&W Kaocrete-D is excellently suited for this service at temperatures to 2500 F. B&W Kaocrete-32 is recommended for service above this range.



B&W Kaocrete-32 has been cast to form the curb walls of a soaking pit. When mechanical abuse from ingots damages the curb, Kaocrete-32 has the necessary properties to localize the damage, thus maintaining the serviceability of the rest of the curb.

The castable lining of this aluminum reverberatory furnace must have unusually high strength to withstand the considerable physical abuse of charging, operating and cleaning, while resisting the penetration of the molten metal. Kaocrete-D is widely used in this application.

How B&W refractory castables solve abrasion problems

Refractory castable linings used in metal-working furnaces are often subjected to severe mechanical abuse. Scraping by hand tools, loading and unloading, and the action of the molten metal and particle-laden gases all affect the life of refractories. Among B&W's line of refractory castables are two that are particularly suited to withstand unusual abrasive conditions. They are B&W Kaocrete-D and B&W Kaocrete-32, both of which have been used successfully in many demanding applications.

B&W Bulletin R-35A gives additional information on versatile B&W refractory castables. Write for copy to The Babcock & Wilcox Company, 161 East 42nd Street, New York 17, N.Y.

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Vern W. Rowe, Washington Chapter chairman, presides at luncheon meeting. Seated left to right: J. M. Wessell, Puget Sound Naval Shipyard; Lt. Gov. John A. Cherberg of Washington; William K. Gibb, Atlas Foundry & Machine Co.; Frank G. Steinebach, *Foundry*; Ashley B. Sinnett, American Foundrymen's Society

Northwest Regional Conference

By FRANK G. STEINEBACH
Editor

● A FINE PROGRAM and true western hospitality drew an attendance of 275 to the tenth annual Northwest Regional Conference, held in Seattle, Oct. 2-3. The conference, sponsored by the Washington, Oregon, and British Columbia Chapters of AFS, had the theme "Better Castings through Fundamental Knowledge."

Technical sessions were opened by a paper on "Hydraulics for the Practical Foundryman" by Prof. William M. Miller, department of civil engineering, University of Washington, Seattle. His discussion dealt mainly with the hydraulic reasons behind the success or failure of gates and sprues. He illustrated the effect of rounding the opening from the pouring basin to the sprue, and indicated that the tapered sprue is best for the hydraulic delivery of metals. He then showed how the inverted T leading to a sheet of metal generates turbulence and develops air inclusions at the sprue base.

Professor Miller pointed to the need for a basin at the bottom of the sprue and stated that it should be as large as possible. He discussed several choked runner schemes and applied this information to both a constant area runner and stepped channel runner. To close, he applied all of the principles to the design of a runner system.

Edward Rommen, quarterman

E. A. Lange, left, Naval Research Laboratory, and David Matter, Ohio Ferro-Alloys Corp.

Alan De Ross, left, Kaiser Aluminum & Chemical Sales Inc., and Fred Wiehl, Federated Metals Div.

One sand session had Richard Grogan, left, Archer-Daniels-Midland Co., and A. A. Belusko, Electric Steel Foundry Co., as speakers

patternmaker, Puget Sound Naval Shipyard, Bremerton, Wash., described some exceptionally large patterns produced at the yard for casting a stern frame for an amphibious assault ship. Since the total weight was about 85 tons and the total melting capacity of the foundry was 23 tons, the frame was made in sections, and the castings were welded together. The CO_2 process was used extensively in the production of these castings.

The first pattern was the foot of the stern frame and measured approximately 15 ft long, 3 ft wide, and 6½ ft high. Metal thickness was 3 in. One section of the casting was molded entirely with CO_2 cores assembled in a pit. Coreboxes were made right and lefthand, and the main core was made so that each of the other cores would lock into it. When the cover core was placed on top, the entire job was locked together. Sand was rammed around the pit, and the mold was complete.

In conclusion, Mr. Rommen made these suggestions for making CO_2 process patterns and coreboxes: 1. Coreboxes should be made so that they can be taken apart. 2. Boxes that are not to come apart need not have more draft than usual, but should be rapped or vibrated before gassing. No release agent is necessary. 3. Clearances are not necessary since the core is exactly the same size as the box. 4. Coreboxes need be no stronger than usual.

Speaking on the fundamentals of the CO_2 process, E. A. Lange, Metallurgy Division, U. S. Naval Research Laboratory, Washington, dealt with several research studies on that subject. The rate at which strength develops in gassing is dependent on the SiO_2/Na_2O ratio of the sodium silicate; maximum strength is dependent on the SiO_2/H_2O ratio. The amount of CO_2 necessary to develop maximum gas strength is that required to increase the SiO_2/Na_2O ratio of the sodium silicate to 4. At low CO_2 flow rates, however, sodium silicate will absorb the amount of CO_2 equivalent to 1 to 1.5 times the amount of Na_2O present. Efficiency of the CO_2 gassing process can be increased greatly by diluting the CO_2 with air.

Proper selection of materials and processing techniques can result in high quality castings. This selection sometimes differs from conventional practice, but involves the control of the same properties and characteristics inherent to any mold and core sand. Data were presented to aid in proper choice of materials and techniques.

M. J. Krumm, Arcair Co., Bremerton, Wash., described the Arcair process. Because a small area of the metal being cut is melted instantly, travel speed is rapid and the surrounding metal does not reach a high temperature, resulting in little distortion and little possibility of crack propagation during the operation.

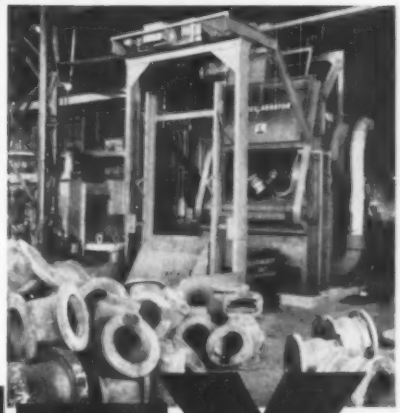
The speaker illustrated applications in both ferrous and nonferrous alloys. These include removal of gates and risers on nodular iron castings, removing excess metal from a turbine casting, removing metal from a high-alloy steel casting, and the removal of large pouring gates and risers from nonferrous castings.

David Matter, Ohio Ferro Alloy Corp., Canton, Ohio, discussed "Production Techniques for Ductile Iron and Problems of the New Producer." He stated that both prod-

Frank Brewster, left, Brumley-Donaldson Co., and John Bermingham, E. F. Houghton & Co.

Charles Smith, General Metals Ltd.; Lovick Young, A-1 Steel & Iron Foundry; Leroy Fink, Electric Steel

TOUGH CLEANING JOBS



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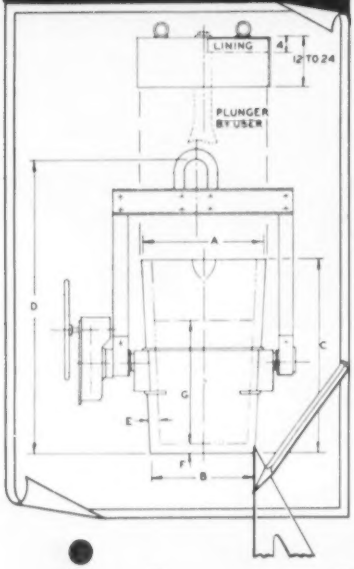

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ucts and techniques are undergoing daily change. Melting techniques usually depend on type of equipment available. Gray iron and malleable shops usually use cupolas; steel foundries use electric furnaces. License arrangements require that new iron foundries going into production use a basic cupola. Larger producers usually have separate facilities for the production of nodular iron.

Iron melted in the basic cupola responds to a smaller alloy addition. Steel foundries find the electric furnace adequate, but must use a high pig charge. Ductile iron foundries have the problem of being unable to use high amounts of gates and sprues in the charge. Mr. Matter indicated that about 75 per cent of ductile iron production now is alloyed in the ladle with a refractory basket holding the alloy.

High Strength Aluminum

Alan B. DeRoss, Kaiser Aluminum & Chemical Sales Inc., Chicago, reported on the properties and aging practices of "High-Strength Aluminum Alloy 357." It is basically an aluminum-silicon-magnesium type which develops exceptionally high tensile and yield strengths with good ductility after heat treatment. High-temperature solution and aging cycles are used. Separately cast test bars show a yield strength in the range of 43,000 psi and ultimate strengths above 50,000 psi.

It is important that foundry melting practice be controlled to prevent iron pickup or other impurities. Chemical composition should be maintained as close to the nominal amount as possible, especially the magnesium content at 0.50 per cent nominal. Fluxing with chlorine gas is desirable, but excessive chlorine gas fluxing removes magnesium, thereby reducing the net amount of magnesium remaining in the casting.

In addition, aluminum chloride, hexachloroethane, and other generally accepted chemicals also are suitable. Highest strengths are obtained with an aging cycle of 6 hours at 350° F for both permanent mold and sand castings.

Fred Wiehl, Federated Metals Div., American Smelting & Refining Co., Los Angeles, gave an interesting review of foundry technical developments. He pointed out that the molding machine was the most important contribution in the 19th century, and that sand control, the permanent mold, centrifugal casting, and the mechanical foundry were developed in the early part of the 20th century. However, greater developments have taken place during and since World War II than in all the previous history of the industry.

Mr. Wiehl discussed also briefly the coreless induction furnace, the controlled atmosphere furnace, vacuum melting, casting procedures, vibrating metal supersonically, shell molding, and coreblowing, the CO_2 process, oil-bonded sand, stack molding, cast forging, supersonic cleaning, cast plating, and developments in alloys.

Frank S. Brewster, Brumley-Donaldson Co., Los Angeles, stated that a foundry can make any casting with West Coast sand that can be made with sands from other locations. In his opinion, the most useful western silica sands are the washed and dried silica Nevada sands ranging from 48 mesh to 135 mesh with base permeabilities from 175 to 30. Steel facings, iron heaps, nonferrous heaps, and all ordinary cores can be made from these sands.

The fusion point of Nevada sands is 3100° F. The grains are rounded, but are not as round as those of Ottawa sand. Other silica sands found in the district include Del Monte quartz, Eugene, Chemult, Chewelah, Sedro Wooley, Wanatchee, Brentwood, and Crystal.

Nevada and Utah Sands

The speaker indicated that a wealth of bank, beach, and dune sand is found along the coast and in Nevada and Utah. These sands are not used for casting steel. The best are good for iron and nonferrous cores, or synthetic molding sands. Many contain fluxes such as feldspar, magnetite, etc., which lower the fusion point and give relief from expansion defects.

The West Coast also has good heavy iron molding sands of 50 to 150 permeability and 20-lb strength. Some excellent fireclays are mined on the coast, and some bentonite is produced. Also, the West Coast has one of the best sources of olivine

in the country. It is produced in four grades—40, 70, 130, and 200 flour—covering the range from heavy steel to aluminum. Mr. Brewster stated that these sands are somewhat expensive but nearly foolproof against expansion.

John Bermingham, E. F. Houghton Co., San Francisco, presented an interesting discussion of core oils. He said that most core oils are organic in nature and are compounded in various proportions to develop general purpose oils. Perhaps 75 per cent of foundries using oils employ the manufactured types. Adding small percentages of oil naturally increases the tensile strength of the core.

Baking temperatures and baking cycles are extremely important. In the normal cycle, 75 per cent of the time is required to remove the moisture, and there is no practical way to cut that time. Only the 25 per cent of the cycle required to set up the oil can be speeded.

A. A. Belusko, Electric Steel Foundry Co., Portland, described that company's sand practice in producing approximately 90 different alloys.

Several types and grades of new sand are employed—including silica from Illinois and Nevada, olivine from Washington, and zircon sand from Australia—for molding methods including shell molding, green sand molding, skin-dry molding, and oven-dry molding. Mr. Belusko presented typical analyses of sand mixes for producing light castings of the low-alloy and manganese types, for the general run of heavy castings of the low-alloy types, for light stainless steel castings up to approximately 500 lb and for high-alloy steel castings from 400 to 1400 lb.

Approximately 65 per cent of the core production is blown. About 5 to 9 per cent of the cores are CO_2 type, and 14 to 18 per cent are cold or air setting. Cores from the general run of medium and heavy castings use a standard oil sand mix containing 21.5 per cent silica flour.

Speaking on "What's New in Cores," Richard Grogan, Archer-Daniels-Midland Co., Los Angeles, discussed conventional core oil practice, the CO_2 process, shell cores, resin binders, the air setting process,

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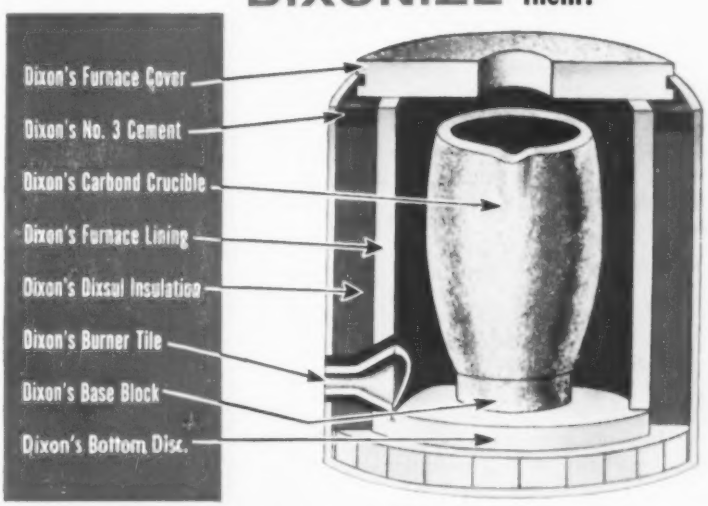

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and the chemically cured process. He stated that core oils made with alkyd resin are the fastest baking oils yet devised. They usually bake twice as fast as conventional oils, yet maintain high strength and other attributes.

The speaker said that silicate-bonded cores will harden immediately when soaked with alcohol. Alcohol has a strong affinity for water and since alcohol evaporates rapidly, accelerating the evaporation of water, the core is cured. Other gases which fall into the acid classification, such as nitric acid, for example, also will cure sodium silicate binders.

The shell core method has gained wide acceptance, particularly in the automotive field and smaller production foundries. By using core sands of 60 to 80 AFS fineness, one can make resin additions as low as 2 per cent on the solid basis, greatly reducing the cost of the sand mix.

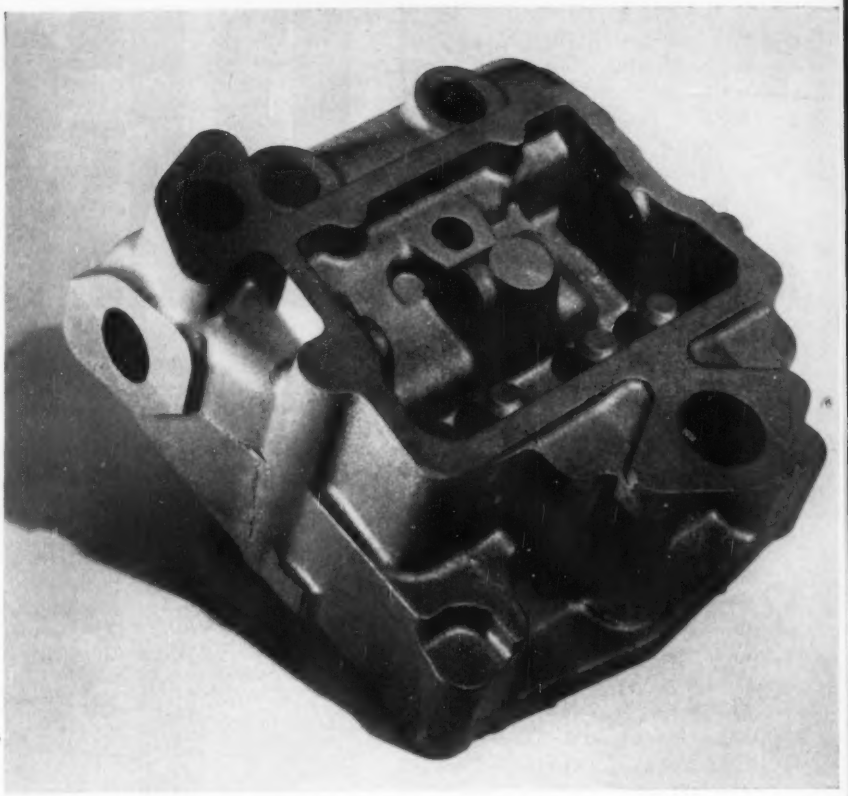
Among the new synthetic resins, phenolics are best used for higher melting metals such as iron, steel, and bronze. The ureas are faster baking at lower temperatures but provide collapsibility and less heat resistance.

Rearranging Molecular Structure

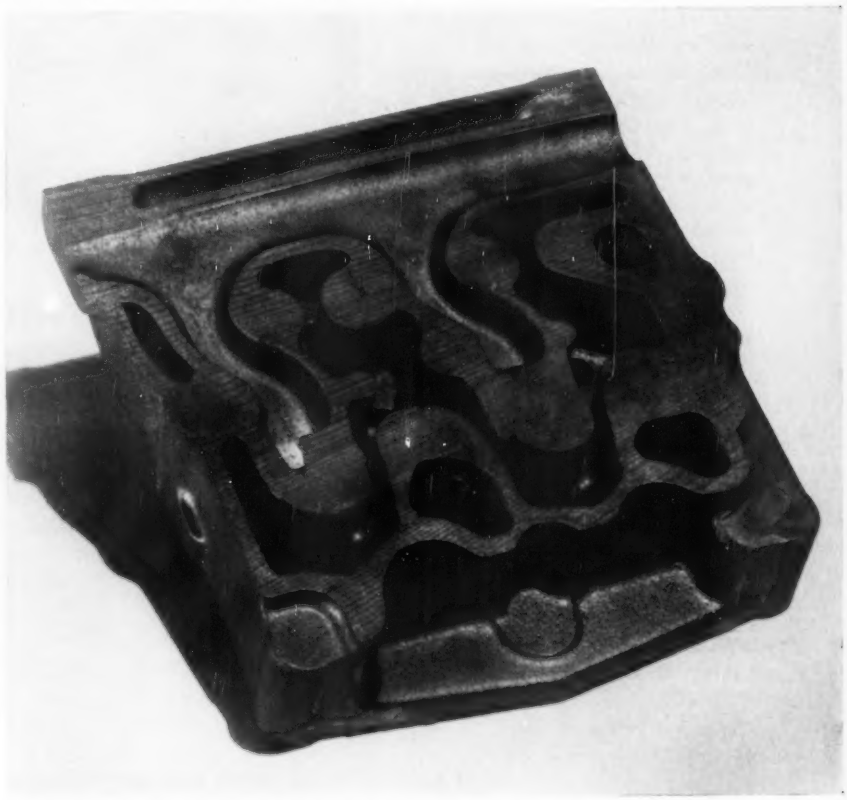
In conclusion, Mr. Grogan suggested the possibility of developing core binders that will require no mixing but will bind sand grains by rearranging the molecular structure of the mass by atomic radiation. Another possibility is an electronic sand binder in which high-frequency sound will change the molecular structure of the sand mass. Both of these are undergoing research.

Speaking as a steel melter to steel melters, Lovick Young, A-1 Steel & Iron Foundry, Vancouver, B. C., asked the question "Are we doing the best we can?" He also asked, "Can our customer rely on even minimum specifications?" Mr. Young advised his listeners, particularly those from the small shops, to find out where they stand by running test bars from every heat for a week. This step will show whether they are getting what they hope or what they expect.

Mr. Young said that the competition of the small foundry is not the other foundry, but weldments. He advised that the melter let the boss



CUTS MACHINING TIME because of the close tolerances and fine surface finish obtained with Durez resin-bonded shell molds and cores.



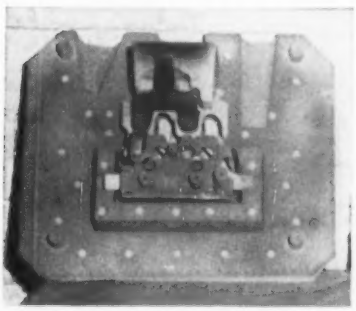
SMOOTH, CLEAN INNER SURFACE—just what the customer ordered—is achieved with shell coring, employing Durez foundry resins.

A "natural" for shell molding and coring

That's the way engineers at Brillion Iron Works, Inc., describe this 22.5-lb. block for an engine used in starting heavy tractors.

Brillion pours this gray iron casting entirely in shell, bonded with Durez resins exclusively.

Why shell? The inner surfaces of the block must be *clean and smooth*. Water flows through these channels, warming up as it circulates between the starting engine and the main engine. Any obstruction or undue roughness in the channels would impair the flow of coolant. From the design standpoint, smoothness is a prime reason for using shell cores.



SHELL CORES provide the accuracy needed for uniform section thickness in block.

From the foundry standpoint, shell coring speeds production, because it eliminates the need for core dryers with their attendant warping and breakage problems.

For even heat transfer without hot spots, the block must be *uniform in section thickness*. With shell molding and coring, Brillion gets the close tolerances that make uniform thickness a fact—and *keep* the block dimensions similar, piece after piece after piece.

Finally, Brillion's customer gets a casting that needs only a minimum of machining—a factor bearing directly on end cost.

Why Durez? Brillion's reasons for standardizing on Durez foundry resins could likewise be *yours*. With Durez resins, you get the unmatched uniformity, drum to drum and shipment to shipment, that's vital to consistent molding results. You also get the newest resin developments *first*, thanks to unremitting Durez research in shell molding.

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worry about the other shop, co-operate with others, and stop fooling himself. The problem is to make steel, not excuses. He emphasized that every bad or indifferent heat of steel hurts the foundry industry as a whole.

The final conference paper, entitled "Induction Melting of Steel," was presented by Leroy Fink, Electric Steel Foundry Co., Portland. Mr. Fink traced the history of the induction furnace, outlined the principles of operation, discussed the power supply and construction of the furnace, and dealt at some length with melting procedure. He indicated that the induction melting process is one of melting only; very little refining action may be obtained. This means that what is placed in the furnace will, to a greater extent than in any other melting operation, govern the final result.

Low-Alloy Steel Melts

In low-alloy steel melts, some carbon loss may be effected by use of oxide. A definite boil will be induced which will be just as effective in sweeping out undesirable gases, such as hydrogen or nitrogen, as that obtained in the arc furnace through the use of gaseous oxygen. Phosphorus and sulfur are hard to remove since there is very little if any slag cover carried in the molten metal.

An amount of slag is generated from the dirt on the charge, but this slag is swept to the walls of the crucible, and bare metal subsequently is exposed to the air.

At the luncheon on the first day, Lt. Gov. John A. Cherberg welcomed the conference to Seattle. Frank G. Steinebach, editor of FOUNDRY, predicted a bright outlook for foundries, but suggested the need for greater confidence in the industry, more attention to modernization of plant and practice, a better price structure, more basic research, extroverts in the field of selling, and a greater use of trained engineers.

The banquet speaker was Wallace H. Campbell, Campbell Industrial Supply Co., Seattle, who has returned recently from a government mission to Europe. The luncheon speaker on the second day was Prater Hogue, Transport Field Service, Boeing Airplane Co., Seattle.

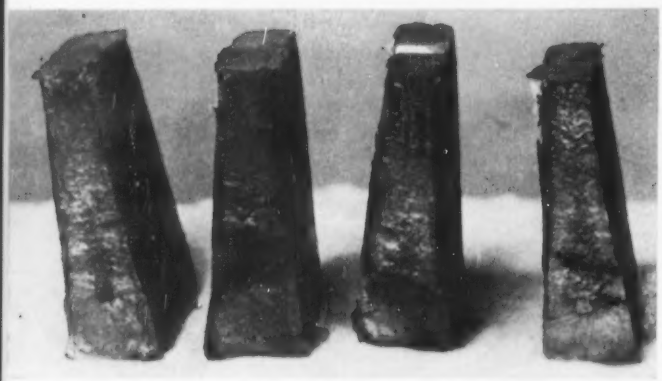


Fig. 1—Chill test results, series A. Per cent of zinc, left to right: 0.00, 0.017, 0.036, and 0.082

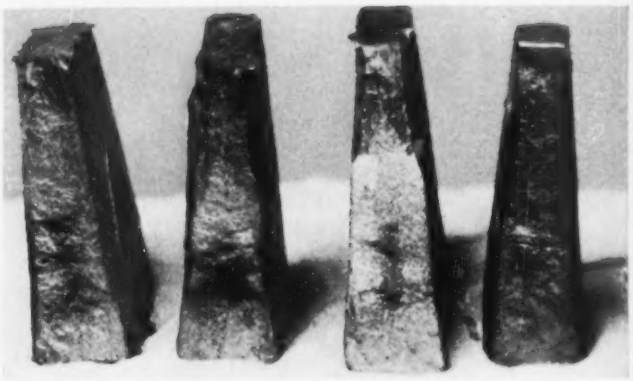


Fig. 2—Chill test results, series B. Per cent of zinc, left to right: 0.00, 0.009, 0.013, and 0.069

How Small Quantities of Zinc Affect Cupola Malleable Iron

Experiments carried out on an industrial scale show that scrap containing zinc is usable for melting purposes. The presence of small quantities of zinc does not render malleable iron unannealable

By JOSHUA PELLEG
Urdan Metallurgical Works
Natanya, Israel

● THE PRESENCE of certain elements in such small quantities that we can call them trace elements influences considerably the ability of malleable iron to undergo graphitization. Elements which restrict the ability of white iron to undergo graphitization because of their carbide-stabilizing effect are called retarders. Those which help the graphitizing process are called promoters.

Elements such as boron, titanium, and vanadium in quantities which do not exceed a few hundredths of 1 per cent promote the process of graphitization, but in larger quantities retard it. The effect of those elements on this process is, therefore, a complex affair.

It is known that zinc also prevents graphitization of white iron during the annealing process. It therefore is advisable not to use scrap melting stock which contains zinc or such other elements as chromium, molybdenum, tin, etc.

Because our plant produces pipe fittings which undergo a hot dip zinc coating process, however, return scrap already is coated with zinc. We also find certain amounts of metal coated with zinc in purchased scrap. In the light of zinc's known ability to retard graphitization, research has been conducted on an industrial scale to evaluate the effects of the element.

Zinc Additions—Zinc is oxidized easily at common oven temperatures. At 1000° C, it burns in air with a bluish-white flame, thus producing fumes of zinc oxide. These fumes escape the cupola, and no appreciable amount of zinc is likely to be retained in the iron. The experiments therefore were carried out by the addition of quantities of zinc not exceeding 0.2 per cent.

Iron was taken from daily production, melted in the cupola. Table I shows the analysis of the base iron used throughout the experiments. Various quantities of zinc were placed in pouring ladles, and 17 to 18 kg of iron was added to each ladle. Table II shows the quantities of zinc used. The analyses of the samples obtained are shown in Table III.

Table III shows that the recovery of zinc is 45 per cent in the best case, under conditions much better than those prevailing in the cupola, where there is free contact between hot air and the scrap containing the zinc.

Iron without zinc and with the various additions of zinc was poured into green sand molds which contained standard test bars as called for by ASTM specifications. In parallel to the test bar castings, chill tests from each ladle were

TABLE I—Base Iron Composition

Experiment	Total Carbon	Si	Mn	S	P	Cr
A-0	3.24	0.98	0.43	0.144	0.121	0.043
B-0	2.96	1.13	0.36	0.139	0.118	0.043

TABLE II—Quantities of Zinc

Experiment	Zinc Added (grams)	Zinc Added (percentages)
A-1	7.0	0.04
A-2	17.5	0.10
A-3	35.0	0.20
B-1	3.5	0.02
B-2	10.5	0.06
B-3	28.0	0.16

poured.

Chill Tests—Fig. 1 and 2 show the chill tests, arranged as indicated in Table II. From measurements of the depth of chill, it was concluded that zinc, in the small quantities used in the experiment, did not influence the dispersion of graphite. Table IV shows the results of these measurements.

The range of the mottled zone was 8 to 10 mm in the A series of experiments and 5 to 6 mm in the B series. If we accept the chill test as an empirical indication of the ability of white iron to undergo graphitization during annealing, the preliminary conclusions as regards the annealing are obvious.

Mechanical Properties—All test bars were annealed in the same pot. The pot was well covered and sealed with a mixture of clay and molding sand to prevent penetration of air or gaseous products of combustion as much as possible. The annealing cycle took 5½ days, which is the standard cycle in a furnace of this type and capacity (14 to 15 tons).

After annealing, the test bars underwent mechanical tests at the Taas laboratories (military industry). Table V shows the results of the tests, which were made on two bars in each instance.

The properties shown are more or less of the same order, and it is impossible to attribute any specific influence on properties to the zinc additions. The small deviations probably are of the order accepted in tests of this type.

Microstructure—Fig. 3, 4, and 5 show microstructures of the samples. These tests were made on all bars, but the three illustrated were chosen as characteristic. They contained 0.00, 0.013, and 0.082 per cent zinc, and there is no difference in the microstructures. The structure is ferrite with some amounts of pearlite (5 to 15 per cent), and the graphite shows a tendency to sprawl. The rim of the fractures contained 20 to 25 per cent lamellar pearlite.

Conclusions—1. The experiments were carried out on the usual industrial scale. Conclusions on the influence of zinc in the percentages described therefore are valid for industrial annealing cycles only.

2. The depth of chill, which was

TABLE III—Analyses of Samples

Experiment	Total Carbon	Si	Mn	S	P	Cr	Zn	Recovery of Zn	Zn Burnt
A-1	3.26	0.94	0.42	0.146	0.121	0.044	0.017	42%	58%
A-2	3.25	0.99	0.40	0.144	0.120	0.043	0.036	36%	64%
A-3	3.23	0.97	0.39	0.146	0.122	0.045	0.082	41%	59%
B-1	2.95	1.14	0.39	0.139	0.119	0.046	0.009	45%	55%
B-2	2.94	1.15	0.39	0.141	0.118	0.045	0.013	22%	78%
B-3	2.96	1.12	0.37	0.140	0.118	0.043	0.069	43%	57%

TABLE IV—Chill Test Results

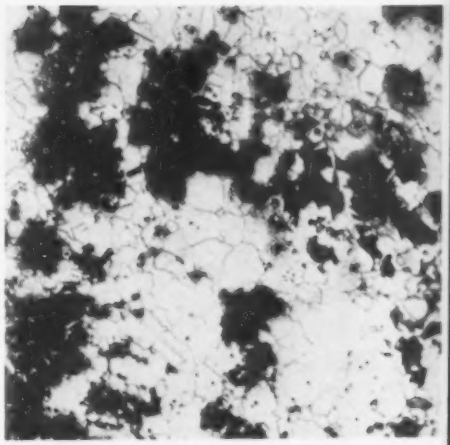
Experiment	% Zinc	Chill Depth
A-0		45 mm
A-1	0.017	46 mm
A-2	0.036	45 mm
A-3	0.082	46 mm
B-0		41 mm
B-1	0.009	40 mm
B-2	0.013	40 mm
B-3	0.069	41 mm

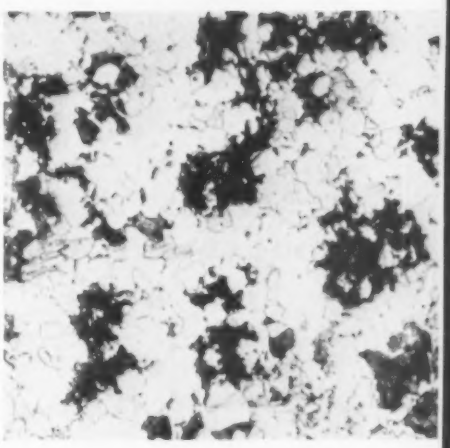
TABLE V—Results of Mechanical Tests

		TEST 1		
		Tensile Test	Yield Point	
Experiment	% Zn	Kg/mm²	Kg/mm²	Elongation, %
A-0		29.6	23.0	7.6
A-1	0.017	29.4	23.1	8.8
A-2	0.036	29.3	23.0	8.4
A-3	0.082	27.7	22.7	8.9
B-0		28.1	22.7	8.5
*B-1	0.009	26.5	22.4	6.4
**B-2	0.013	27.6	22.9	8.0
**B-3	0.069	26.4	22.1	8.0

		TEST 2		
		Tensile Test	Yield Point	
Experiment	% Zn	Kg/mm²	Kg/mm²	Elongation, %
A-0		28.7	23.3	7.3
A-1	0.017	29.4	21.7	8.6
*A-2	0.036	28.3	22.7	
A-3	0.082	27.3	22.9	8.9
B-0		28.9	24.0	7.5
*B-1	0.009	25.5	23.0	
B-2	0.013	28.0	23.5	7.5
B-3	0.069	29.2	24.0	7.7

*Rupture in test bar
**Twisted bar





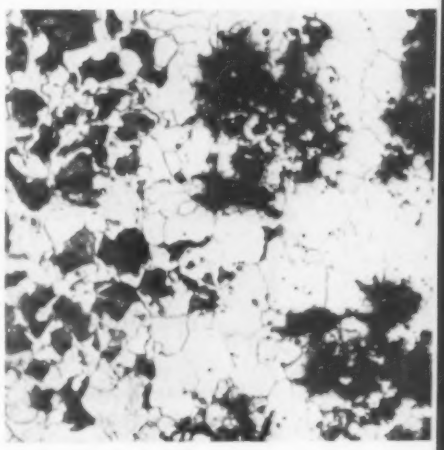
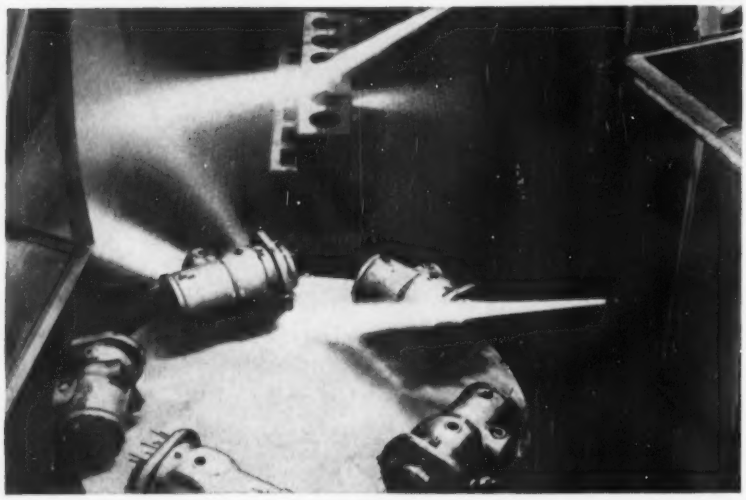


Fig. 3, 4, and 5 (top to bottom)—Microstructures of characteristic test bar samples. In order, they contained 0.00, 0.013, and 0.082 per cent Zn. There is no difference in the microstructures. All are ferrite with some amounts (5 to 15 per cent) of pearlite

HYDRO-BLAST

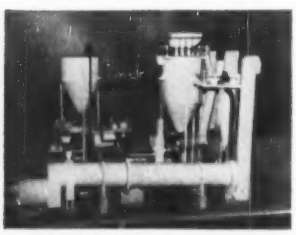
works wonders with sand!



Knocks out cores, cleans castings in a fraction of usual man hours

With Hydro-Blast Equipment, one man can clean the largest, most complicated castings in a fraction of the usual time. Heavy, intricate cores are knocked out—all casting surfaces are de-scaled, left exceptionally clean. The process is completely dustless. Hydro-Blast installations pay for themselves quickly through better, faster cleaning, more healthful working conditions.

Recent Hydro-Blast installations: General Electric Co., Schenectady, N.Y. . . . Gould Pump Co., Seneca Falls, N.Y. . . . Bethlehem Steel Co., Sparrows Point, Md.

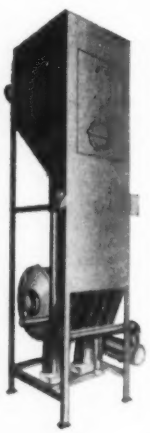


Hydro-Blast Wet Sand Reclamation Units

Cleaner, good-as-new core and molding sand, with fully controlled classification. *Recent installations: General Electric Co., Schenectady, N.Y. . . . American Radiator & Standard Sanitary Co., Buffalo, N.Y.*

Hydro-Blast Dry Sand Reclamation Units

Recent installations: Farrell Birmingham Co., Ansonia, Conn. . . . Adirondak Steel Foundries, Watervliet, N.Y. . . . Amsco, Chicago Hts., Ill. . . . Midcontinent Steel Castings Co., Shreveport, La.



HYDRO-BLAST DIVISION
GUARDITE
WHEELING, ILLINOIS
DIVISION of AMERICAN-MARIETTA COMPANY

the same in all instances, does not show that zinc retards graphitization when present in the quantities used in these experiments.

3. Table III shows that for melting purposes, it is possible to use scrap containing zinc in quantities well in excess of 0.2 per cent of the charge. This procedure is possible because the degree of oxidation in the cupola is higher than in the experiments.

4. Structural analysis and mechanical tests show that with ordinary industrial cycles, inferior mechanical properties do not result. They also show that zinc in small quantities does not render malleable iron unannealable.

The experiments described do not contradict the results of laboratory research which indicated that small quantities of zinc retard graphitization and therefore lengthen the annealing cycle. It is necessary to take into account that industrial annealing cycles in an oven of 14 to 15-ton capacity are longer than laboratory annealing cycles. Results obtained in the current experiments are due to the extra time needed in an industrial annealing cycle and to variations in analysis. It is the aim of the author to continue experiments of the same type with quantities of zinc greater than those described in this article.

Acknowledgment — The author wishes to thank Messrs. Potaszkin and Bloch of the Taas laboratories, who made it possible for the mechanical tests to be carried out.

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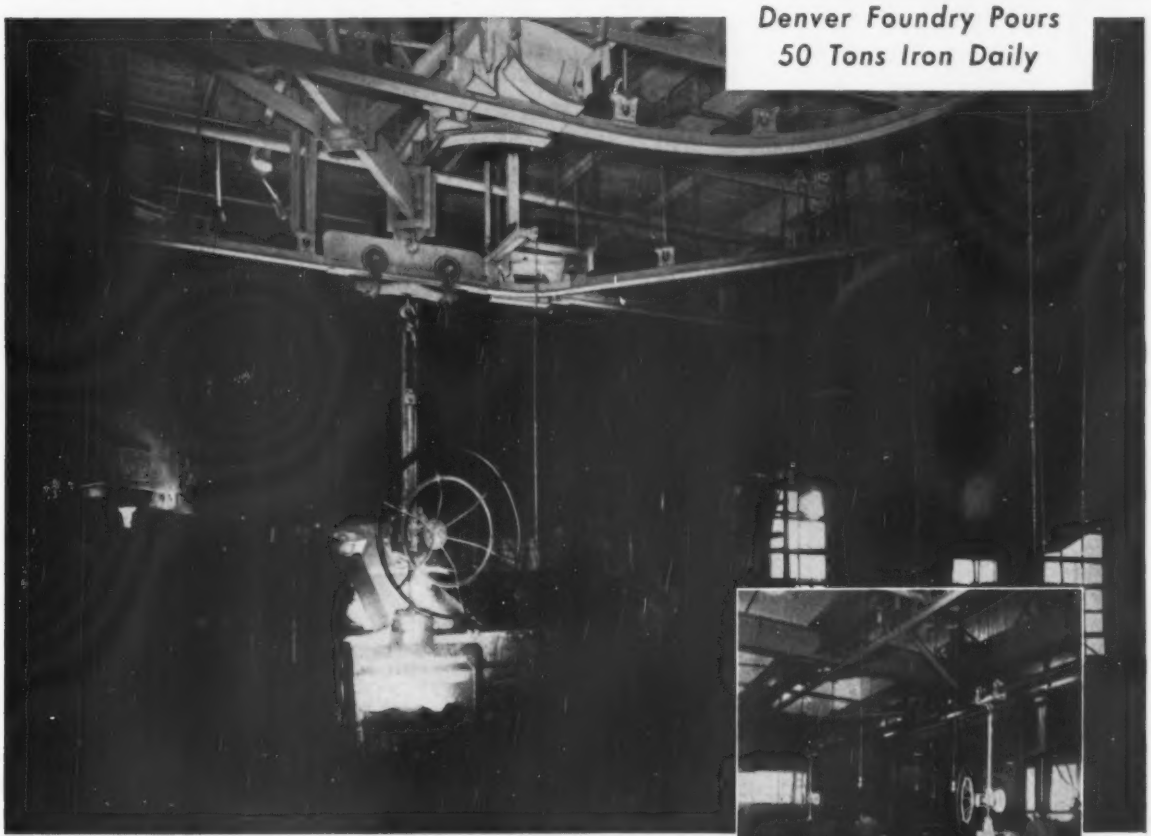
LOW MAINTENANCE IS FEATURE OF *HARD-WORKING* TRAMRAIL INSTALLATION

Denver Foundry Pours 50 Tons Iron Daily



▲ As illustrated here, Cleveland Tramrail can be readily installed to permit any material flow pattern and provide handling coverage exactly as desired. In a matter of seconds the ladle being filled here is on the pouring floor.

An overhead track loop serves the pouring floor. Several molds can be poured simultaneously and empty ladles returned to the cupola and filled ones moved in without interference because of the diagonal cross-over tracks from one side of the loop to the other. ▶

SINCE 1948 Cleveland Tramrail equipment consisting of cranes and an extensive track and switch system has played an important role in speeding production, cutting costs and aiding safety in the foundry division of the Electron Corp., Denver, Colorado.

50 tons of ductile and gray iron are poured per day in this continuous high-production foundry. Pouring ladles of 1000 and 1200 lb. capacity deliver the hot metal from either of the two cupolas directly to the molds, thereby keeping handling to a minimum and reducing heat loss. The overhead track arrangement permits unhampered two-way travel of the Tramrail ladle carriers, thus enabling uninterrupted production. After these years of hard, full-production service, one feature of the Tramrail equipment for which there has become a growing awareness is the extremely small amount of maintenance required.

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CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

Circle 651 on Page 53

H. A. Williams, Eaton Mfg. Co., spoke at the general session

MISSOURI CONFERENCE

Covers Wide Subject Range

By ROBERT H. HERRMANN
Associate Editor

● UNIVERSITY of Missouri, School of Mines & Metallurgy, was host to the Third Missouri Valley Regional Conference, Sept. 24-25, at Rolla, Mo. Sponsored by the St. Louis, Mo-Kan, Tri-State, and MSM Student chapters of the American Foundrymen's Society, the conference drew an attendance of about 220.

Conference Chairman Dan A. Mitchell, Progressive Brass Mfg. Co., Tulsa, Okla., opened the conference and introduced Dean Curtis L. Wilson, MSM, who welcomed those attending. He stated that meetings of this type are a worthwhile effort to improve the foundry industry. He also spoke of the Foundry Educational Foundation program, in which MSM participates, of expanding student training in foundry technology at the university level. He commended competitive foundries for uniting in this cause.

Webb L. Kammerer, Midvale Mining & Mfg. Co., St. Louis, and AFS regional vice president, responded to Dean Wilson's welcoming address and spoke briefly on AFS activities. William W. Maloney, AFS, described the Training and Research Institute program and discussed AFS plans to construct a building for T&RI activities in the future.

Howard A. Williams, Eaton Mfg. Co., Cleveland, addressed the general session on **What the Customer Expects from Foundries.** Foundry salesmen should have a progressive approach to selling castings. They must understand a customer's needs and be capable of working with the company's designers and engineers. Foundrymen usually can design a casting better than can a customer company's engineers. Foundrymen should be in on the design of a part, because once a part is designed for some other manufacturing process changing the design for casting is difficult.

Eaton's experience indicates that foundries do a poor job of educating customer engineers to the advantages and use of castings. Recently Eaton instituted a program to reduce the weight of cast parts it buys. To date, the program has achieved a saving of $500,000. The initiative for the program should have come from foundries.

When casting prices are raised, the increase should not be across the board. Castings differ, and their cost elements are different.

Shown at the Friday luncheon speakers' table, left to right, are: H. W. Dietert, former national AFS president; Dean C. L. Wilson, MSM; A. Carl Weber, speaker; R. C. Kane, committeeman; D. A. Mitchell, chairman of the conference, and H. F. Scobie, Non-Ferrous Founders' Society

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Comes out better with

KOPPERS *Premium Foundry Coke*

You'll have fewer rejects—far better quality castings when you switch to Koppers Premium Foundry Coke. Car after car, Koppers delivers a superior coke that's absolutely *uniform* in *size, strength, structure* and *chemical analysis.* Because of the higher carbon content in Koppers Premium Foundry Coke, the foundryman can maintain a higher temperature range which increases the cleanliness of the iron. This in turn, helps reduce fuel consumption—means lower operating costs all around. Next time order Koppers Premium Foundry Coke. Available anywhere in the U.S. or Canada in sizes to meet your needs. Koppers Company, Inc., Pittsburgh, Pa.

WE CHECK EACH DAY'S RUN to make certain you get foundry coke of the exact size and chemistry that is most efficient for the job. Analyses are available to your foundry on request.

Circle 652 on Page 53

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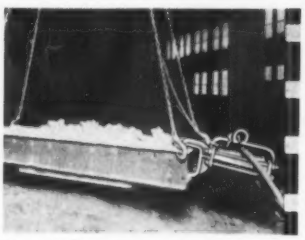
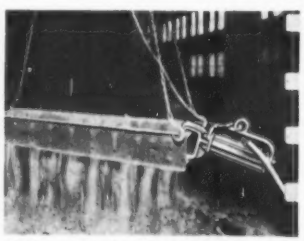
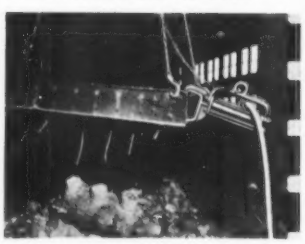


I'm takin' over . . . SEE
You Can't Beat THIS RAP!



It's a Shakedown SEE!



SEE BUD? Just 5 Sec's
Man You're REAL GONE!

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Circle 653 on Page 53

Therefore, price increases should be geared to specific castings involved. Whatever the price it should include a reasonable profit.

Harry H. Kessler, Sorbo-Mat Process Engineers, St. Louis, in addressing the Thursday luncheon group related some of his experiences in his hobby as a prize fight referee. A. Carl Weber, Laclede Steel Co., St. Louis, spoke at the Friday luncheon. He made some thought-provoking comments on trends in this country concerning the buying of foreign and domestic products and their effect on the country's economy.

STEEL

Cast Steel—the "Last Word" in Engineering Material, by Jules Henry, Missouri Steel Castings Co., Joplin, Mo. Many design engineers are not fully aware of the advantages of cast steel as an engineering material that is available at nominal cost in small or large quantities. Steel foundrymen should make a concerted effort to bring to design engineers and to all industry a full appreciation of this metal.

Steel offers a wide range of mechanical and physical properties. It has a high modulus of elasticity and high strength for a given section size. It has normal machinability and is easily weldable. The casting process offers a wide degree of design freedom to achieve eye-appealing, streamlined shapes that are low in stress concentration area. End products resulting from use of castings usually are serviceable and low in cost.

Dielectric Core Baking, by Mitchell B. Milonski, American Steel Foundries, Granite City, Ill. After approximately two year's experience with a 200-kw dielectric core oven, American Steel Foundries has noted the following advantages:

Core rodding can be reduced because of less handling of green cores and higher strength in dried cores. Cores dry uniformly with sharp corners and will not overbake. Because drying racks are not needed, their cost is saved as is the labor expense of loading, unloading, and moving them. Drying time is reduced to about 15 minutes. Working conditions near the oven are improved because of the absence of heat and a minimum of smoke and fumes which are exhausted easily. Dryer and coreplate inventories can be reduced. Minimum installation cost is involved.

Disadvantages noted are: Nonconductor core plates must be purchased. Core mixes are restricted to those using phenolic resin binder. Breakdowns are costly because of possible loss of castings production and the idling of high-production, incentive coremaking units grouped around the conveyor leading to the fast-drying oven. Fuel cost is about three times that for gas-fired, recirculating batch ovens. Maintenance cost and parts inventories are higher than required for conventional core drying facilities.

Left to right: Louis B. Allen Jr. and Frank K. Speckhart are attending MSM on scholarships by H. H. Kessler, right, Sorbo-Mat Process Engineers

Can a Market Be Produced?, by George K. Dreher, Steel Founders' Society of America, Cleveland. Developing a market depends mostly on having the correct mental approach. Think big; think in terms of success; think about market development as an investment for future profits. Develop new products, new designs, better methods, improvements. Markets are not made by trying to take work away from a competitor's foundry.

Since change is the only permanent factor in today's market, product trends should be watched so that market development effort will be in the correct area. A degree of specilization in producing certain types of castings is necessary for success.

Can Bentonite Be Evaluated?, by Arthur Zrimsek, Magnet Cove Barium Corp., Des Plaines, Ill. In general, foundrymen feel that casting quality is related to bentonite qual-

ity. However, a foundry industry survey indicates that the absolute quality or type of clay binder used has little effect on casting quality. It would be better to say that casting quality depends on proper usage of bentonite of any quality.

A change in bentonite quality can not be evaluated by a simple test. There is no good or bad quality. Foundries using clays categorized in either group are producing good castings. The main thing to look for in clays is uniformity. Bentonites which work well in one foundry may not be satisfactory in another foundry.

There are, however, two basic differences in bentonites. If they are understood, troubles should be minimized. The differences are in the amount of water and amount of mulling time they require.

Material Handling and Maintenance at General Steel Castings, by Vernon Lich, General Steel Castings Corp., Granite City, Ill. Production scheduling and ability to produce in any foundry depends on smooth material handling and avoidance of downtime at production machines. Mechanization and maintenance must work together. General Steel tries to balance the two in any improvement program.

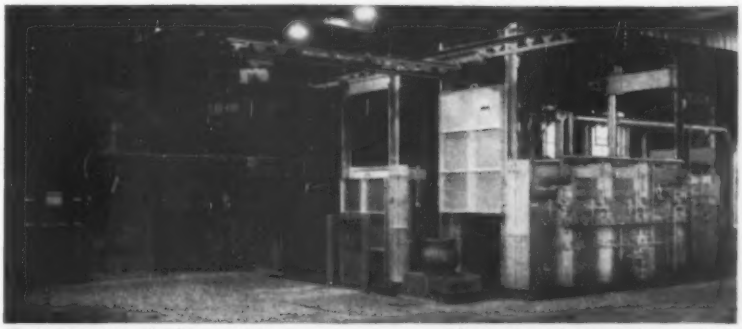
Eight examples were cited. They dealt with crane modernization, floor cleaning equipment, a prepared sand distribution system, dry binder storage and delivery, pneumatic tube metal sample conveyor, lift trucks, the power conveying of flasks and cores, and maintenance of rubber conveyor belts.

What Is a Cereal Binder?, by C. F. Louich, Corn Products Sales Co., Chicago. Most cereal binders used by foundries in the United States are made from yellow dent corn. Their use in sand is to facilitate retention of moisture. Green compression, green deformation, green shear, and overhang strengths are contributed along with baked tensile strength without adversely affecting collapsibility at shakeout.

IRON

Fundamentals of Cast Iron Metallurgy, by William H. Moore, Meehanite Metal Corp., New Rochelle, N. Y. Proper metallurgical control to obtain the desired structure and properties in cast iron

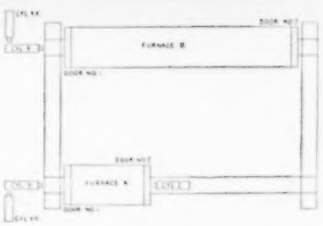
this Waltz continuous car furnace is delivering 50% more production than guaranteed



▼ Loading station for Furnace "A."

▲ Casting on first car at Furnace "A."

One of the Midwest's largest foundries reports this exceptional performance from this Waltz continuous car furnace especially designed for them. This installation anneals, preheats before welding and stress relieves after welding in a "push-button" operation. As shown in diagram Furnace "A" is the welding preheat furnace, and holds five cars. The operator pushes a button and #1 door on Furnace "A" will open, and when fully opened a car will come out of the furnace.



The operator removes a casting, pushes the return button, and the car goes back into the furnace and the door closes. When this casting is welded, a button is pushed for Furnace "B," which will open #1 door, and when that door is completely opened a car will come out and the welded casting is placed on this car. A return button is pushed, and the car goes back into the furnace and door #1 closes. This procedure is followed until all the castings on the first car in Furnace "A" are welded and moved to Furnace "B." The empty car from Furnace "A" is then transferred and pushed into Furnace "B." While this is being done, another loaded car is pushed into Furnace "A." This procedure is followed until all the castings are finished welded and moved to Furnace "B."

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Please send me without obligation this new 33 page illustrated book, with photos and technical description of this furnace and 13 other WALTZ car bottom furnaces.

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Circle 654 on Page 53

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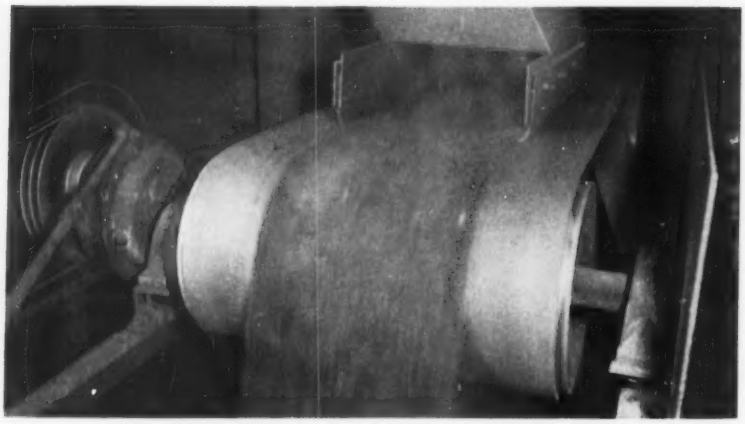
Says Foundry Superintendent



Here the Stearns Series 410 20x24 pulley, mounted in a pulley separator unit, removes tramp iron from foundry sand at Falls Foundry, Menomonee Falls, Wisconsin.

"No more damage to patterns"
"No more injury to workers' hands"

Falls Foundry, Menomonee Falls, Wisconsin, installed a new Stearns INDOX V permanent magnet pulley about a year ago. A. E. Lapp, foundry superintendent, states: "This Stearns unit is doing an outstanding job. We run about 125 tons of sand over the pulley every day, and pull out about a half to three-fourths of a ton of iron a day. Before we put this magnetic pulley in, we reclaimed the sand by means of a sand cutter and brush system. The first time we used the pulley, we pulled out about 6 tons of iron."

Saves patterns, workers' hands

Mr. Lapp estimated that before installing the pulley, the company had about $150 per month in pattern damage. This was due to chunks of iron that were left in the sand. Since putting in the Stearns pulley, they have not had a single bit of pattern damage. The same thing with injuries. Before the pulley, workers were constantly hurting hands and fingers on sharp iron bits. Now there are no cases of hand injury while working in the sand. Mr. Lapp further states: "We used to pay a salvage outfit $5 a ton of scrap metal to salvage it. Taking this saving along with our pattern saving, we're ahead about $3,000 a year. You couldn't take this pulley away from me."

No Electrical Cost

Find out how a new INDOX V magnet pulley can save you money. No electric cost — no maintenance cost — tremendous magnetic pulling power. Nothing matches this new INDOX V material. A Stearns representative can give you facts and figures. Write us today for nearest representative and new free literature. Specify Bulletin 1021G.

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depends on forcing graphite to precipitate at the correct time during iron solidification. That can be done by chilling, nucleation, inoculation, or graphitization, or by adding carbide stabilizers.

The Meehanite process employs nucleation or inoculation by the addition of alkaline earth silicides such as calcium silicide. In addition close control must be maintained over the iron chemistry and its relation to the carbide value of the melt. Importance of the influence of minor elements in iron on its characteristics also was discussed.

Sand Practice in the Iron Foundry, by Joseph Schumacher, Hill & Griffith Co., Cincinnati. Step-type test castings were poured in sand molds of various hardnesses and with moisture contents of 2.7, 3.5, and 4.0 per cent. All other factors were held constant. Test results showed that physical properties of the sand varied widely with small changes in moisture and mold hardness. Also, casting quality, dimensions, and weight varied, and the degree of riser feed differed, showing that mold wall movement occurs unless care is exercised in making molds.

The best casting was made in a hard mold with optimum moisture content, in this case 3.5 per cent. This mold was the only one which produced a casting smaller than the pattern.

Gating and Risering of Iron Castings, by Charles F. Walton, Gray Iron Founders' Society, Cleveland. There is no simple approach such as use of tables or formulas for determining size or placement of risers. An understanding of the principles of metal flow and solidification and of the purposes of risers is necessary. Those principles were discussed. The purposes of risers were listed as: To vent the mold cavity, to avoid hydraulic ram effect, to indicate when a mold is full, to flow off cold metal, and to counterbalance liquid contraction.

Fundamentals of Cupola Practice, by Walter R. Jaeschke, Whiting Corp., Harvey, Ill. Factors of cupola operations that affect the combustion and melting conditions were discussed. Emphasis was placed on the importance of coke quality, material size, stock distribution, and hang-ups. The speaker

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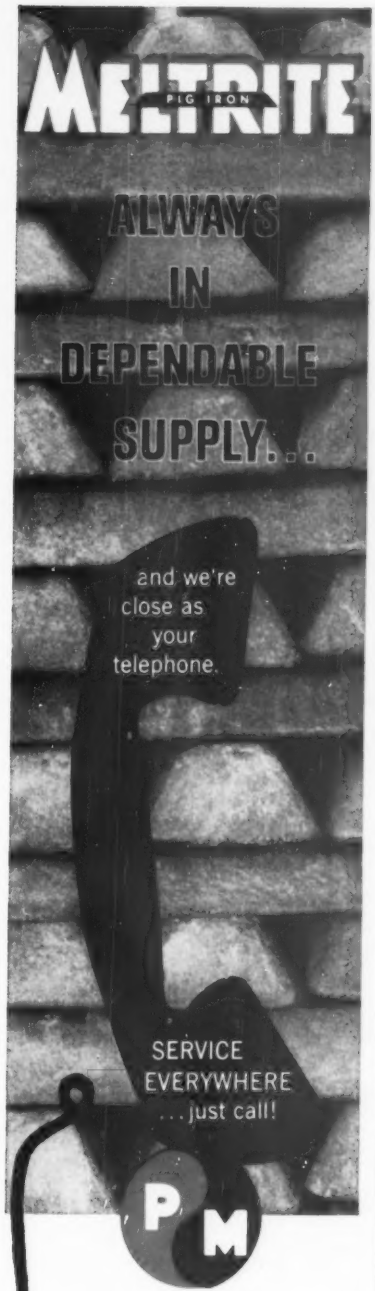

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also described accessory equipment to aid cupola operators in obtaining uniform quality iron. The history and development of water-cooled cupolas since their invention in the late 1800s also was discussed.

Cold Setting Cores for Iron Castings, by Daniel R. Chester, Archer-Daniels-Midland Co., Cleveland. Developments in application of air-setting binder for cores and molds since its first use in 1939 were outlined. The process fits well in jobbing shops making medium and large castings. Its use is limited in high-production foundries because of the relatively slow turnover of any one corebox.

The most successful applications have been where foundry operations are designed for its use. Certain adjustments are necessary. These may be minor, but profitable use of the process depends on proper layouts of core and molding areas where the sand mix is used.

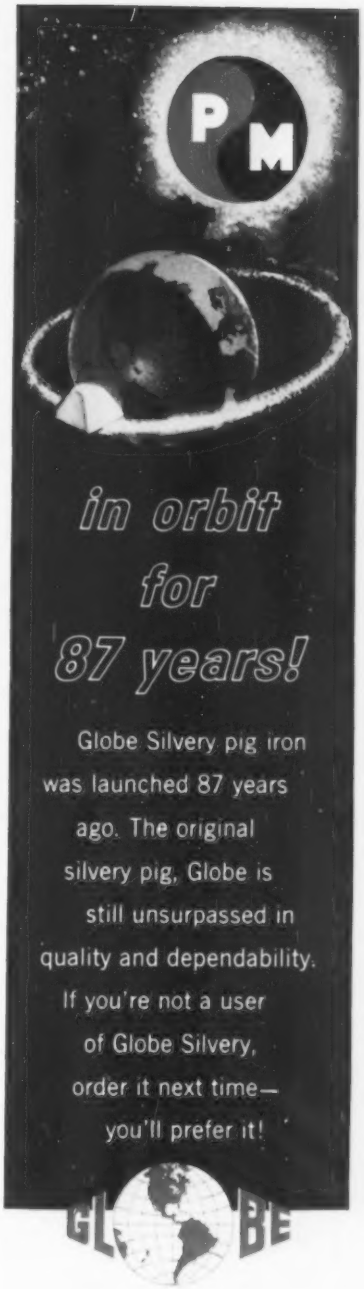
Future of the process looks good. Current research programs are devoted to producing a nonbaking, high-tensile, good collapsibility binder having minimum susceptibility to problems caused by climatic or operational conditions.

Shell Cores for Iron Castings, by Earl W. Jahn, Production Pattern & Foundry Co., Chicopee, Mass. Rapid expansion in the use of resin-bonded sand shell cores started with the development of coated sand which minimized segregation problems in core blowing. Advantages of shell cores were stated as economy; accuracy; light weight for easier handling; production of smooth-surface, high-quality castings; less equipment and floor space requirements; less time for production, and less direct and indirect labor cost.

Disadvantages were listed as the need for acquiring knowhow on proper coating of sand, the cost of gray iron coreboxes, and the handling of hot cores from the box.

NONFERROUS

Melting and Fluxing of Nonferrous Metal, by Harry C. Ahl, Malleable Iron Fittings Co., Branford, Conn. Seven basic practices for good melting are: Use only clean metal of known composition; use clean furnaces or clean crucibles; melt quickly; melt in a neutral or slightly oxidizing atmosphere; do



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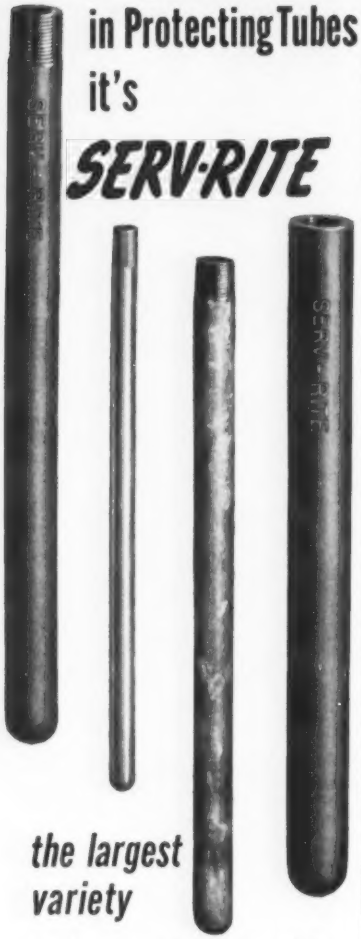

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Circle 658 on Page 53

not superheat the metal more than necessary; skim the melt without excessive agitation after removal from furnace; keep accurate temperature measurements of all heats.

Some metals require fluxing, but fluxing is not a cure for bad melting but is a supplement to good melting practice.

Aluminum Castings—Defects and Their Correction, by D. L. LaVelle, American Smelting & Refining Co., South Plainfield, N. J. Defects from nonmetallic inclusions and porosity were discussed, their causes explained, and preventive measures suggested. Mixing of molten metal with air results in dross and oxide. Allowing too short a time for flux to separate from metal results in flux inclusions. Careless pouring causes porosity from trapped air, and improper or inadequate gating, risering, and chilling practice causes shrinkage porosity. Gas porosity can be minimized by careful melting and adequate degassing.

Melting and Casting of Aluminum Bronzes, by J. D. Dick, Montreal Bronze Ltd., Montreal, Quebec. Because of high-volume shrinkage characteristics and a tendency to form dross, aluminum bronzes cannot be handled by melting, molding, and casting techniques suitable for other brass and bronze alloys. But an understanding of the proper casting production techniques is worthwhile because aluminum bronzes have good mechanical properties with ability to retain those properties at fairly high temperatures and good resistance to corrosion and wear.

Proper melting, fluxing, molding, gating, and shakeout procedures were discussed in detail.

Permanent Molding—Static and Centrifugal, by N. A. Birch, National Bearing Div., American Brake Shoe Co., St. Louis. The static permanent molding of copper-base alloys is almost limited to the aluminum bronzes, although some silicon bronze and some manganese bronze castings are being made. The skin-forming alloys have possibilities; the red brasses and leaded alloys seem impossible.

To be practicable, permanent molds require production quantities of at least 5000 units. Casting shapes are limited to straight partings and must be designed to avoid cooling stresses and hot tears. Initial de-

THE BIG SWITCH IS ON

Ray Gilbert, Foundry Engineer of the Great Lakes Founders & Machine Corporation of Ludington, Michigan, says:

"We have switched to Acme Resin for the coating of our Sand after years of experimenting with other resins. We have been able to reduce or eliminate thermal shock entirely. Our flowability has improved considerably, giving us better definition of detail; and—all this for less money."

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Circle 659 on Page 53

livery of castings takes three to five times as long as for sand castings. Special melting facilities are required to furnish a continuous supply of metal to molding stations.

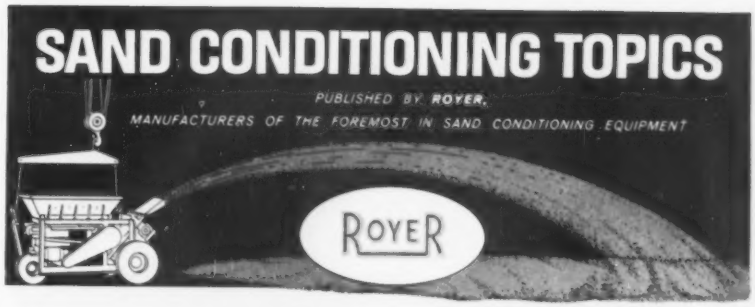
Centrifugal casting of copper-base alloy parts in vertical and horizontal axis machines was discussed. Advantages of the process are found in good quality castings, improved mechanical properties, and pressure tightness. Usually red metal alloys are used. The skin-forming alloys, aluminum and manganese bronzes, and silicon bronze benefit little in mechanical properties by centrifugal casting.

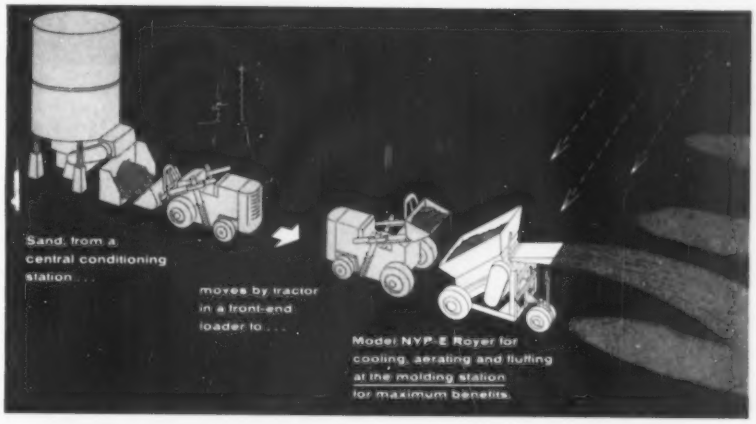
Nonferrous Castings — Defects and Corrections, by Ray Cochran, R. Lavin & Sons Inc., Chicago. Listing defects and trying to devise remedies is a back-door approach. Foundry practice should be directed to making good castings at the outset. Four basic points for making good copper-base alloy castings are to use good melting practices which have been developed; employ good gating systems which permit rapid mold filling; prevent aspiration of gas, mold erosion, and carrying of dross or slag into mold cavity; promote directional solidification, and give maximum yield and minimum cleaning cost. Use good risering practice for proper feeding. Pour at the optimum temperature for the alloy being used.

Almost Every Foundry Can Have Improved Sands, by E. E. Woodliff, Foundry Sand Service Engineering Co., Detroit. Sand mixtures never reach homogeneity. Most sands and binders retain their individual characteristics in any combination. If these characteristics are known, prediction of the behavior of a prepared sand is comparatively easy. In addition, however, the behavior of trace elements in sand mixes must be understood. Since sand mixes respond readily to control, a broad program of correction and control should present no problems.

New Engineering Building For Cornell University

Cornell University, Ithaca, N. Y., plans construction of a new metallurgical engineering building to cost $1.5 million. The new building, which has been given to the university by Francis N. Bard, president, Barco Mfg. Co., Barrington,




Sand, from a central conditioning station . . .
moves by tractor in a front-end loader to . . .
Model NYP-E Royer for cooling, aerating and fluffing at the molding station for maximum benefits.

THERE IS A SAND CONDITIONING SYSTEM TO FIT YOUR BUDGET . . .

Here is a positive cost-cutting sand conditioning system that falls within the budget limitations of the small or medium semi-mechanized foundry. It delivers better sand without adding to time or manpower requirements, and without the expense of complete mechanization. It gains the advantages of fluffing after handling, as the final step at the molding station.

Teamed with front-end loader, this Royer NYP-E Portable moves from floor to floor in this grey iron foundry. What used to be caked, packed sand from mulling is now a cool, fluffy pile.

An integral part of this practical system is the Royer Model NYP-E Sand Separator and Blender. It can be moved swiftly from station to station, delivering cooled, aerated, fluffed, perfectly conditioned sand right where it's wanted. With this Royer you can really get all the advantages of central system sand control.

Your system is probably "different." There's still a versatile unit of the Royer "NY" Series to fit it . . . and improve it. As a stationary model, the "NY" will fit into a conveyor system, or can be installed to take the discharge of stiff sand directly from your muller. However you use it, the Royer vastly improves sand, saves time and money, improves yield and quality of castings —all at a fraction of a cent per ton of sand.

We'll be happy to have an experienced, foundry-wise Royer agent call to help you work out the system that's best for your operation. Or, if you prefer, we'll rush you a copy of Bulletin NY-54, giving further information about these units and how you will benefit from them. When you're convinced, *you* can call in your Royer agent and take the first step towards better sand with a Royer system.

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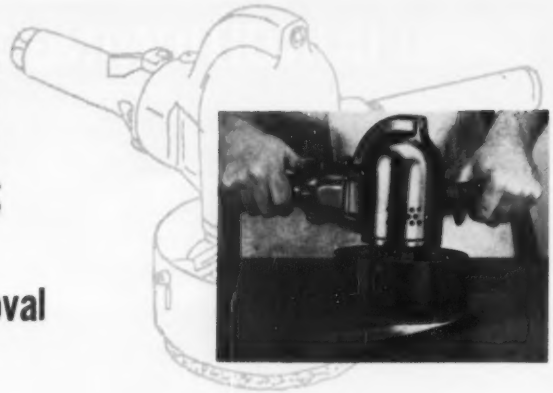
to cut metal-removal costs



No matter what kind of a metal-removal problem you have, chances are you'll do it faster, cheaper with an Airetool grinder. Airetool makes all sizes and types of grinders — for every industrial need. You can choose the best grinder for your need. Get full details, write for Catalog 67. Or better yet, telephone us for a no-obligation demonstration in your plant.

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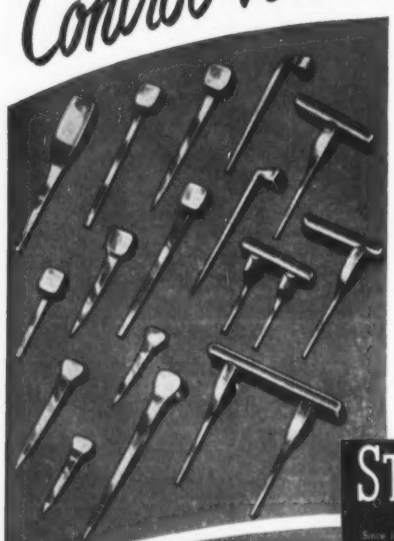
Control Foundry Chilling with CHILL KOOLHEAD NAILS



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Write for detailed descriptions and prices.

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Circle 662 on Page 53

Ill., will enable Cornell to improve and strengthen its program in metallurgical engineering. Mr. Bard is an alumnus of Cornell and in 1947 established an endowed chair in metallurgical engineering at the university.

ICI To Hold Annual Meeting In Chicago on Nov. 3-4

The Investment Casting Institute will hold its seventh annual meeting at La Salle Hotel, Chicago, Nov. 3-4. Directors and committees will meet at separate sessions on the morning of the first day. During the business session in the afternoon officers and directors will be elected, next year's budget approved, and plans made for future ICI activities.

Technical and management discussion sessions will be featured on Nov. 4. Paul Gouwens, Armour Research Foundation of Illinois Institute of Technology, Chicago, will review current research developments important to investment casters.

T. E. Millard, General Electric Co., Schenectady, N. Y., will speak on "An Appraisal of the Current Status of the Ceramic Shell." A panel discussion on ceramic shell investment molding moderated by Dr. N. J. Grant, Massachusetts Institute of Technology, Cambridge, Mass., will follow. Dr. Grant, who recently returned from Russia, will present "Some Observations on Russian Investment Casting Techniques."

Lawrence Schwedes, Lawrence Laboratory, Santa Monica, Calif., who recently toured European investment casting foundries, will report on "What We Can Learn from European Investment Casting Techniques."

Management session subjects are "A Basic Cost Estimating System for Smaller Plants," by Freeman Jones, Misco Precision Casting Co., Whitehall, Mich.; "Where Are the Investment Casting Buyers?" by David W. Veit, *Precision Metal Molding*, Cleveland, and "Costing, Quoting, and Selling Problems" and "Practical Tips on an Effective Quoting System for the Average Job Shop," both by Walter A. Dubovick, Engineered Precision Casting Co., Matawan, N. J.

Obituary

John I. Ducate, 33, executive vice president, treasurer, and a director of Taccone Pneumatic Foundry Equipment Corp., North East, Pa., died Oct. 4. He was also secretary-treasurer and a director, Foster Aluminum Co., a division of Taccone, and a partner in W. V. Soder Mfg. Co., Erie, Pa.

Arthur E. Martin, 53, metallurgist, Ainsworth-Precision Castings Co., Fayetteville, N. Y., died Sept. 30, in an automobile accident.

Evan F. Wade, 75, owner, Wade Pattern Co., Detroit, died Oct. 3. Born and educated on the Isle of Man, England, Mr. Wade went to Detroit from Cleveland 40 years ago.

Ralph Whaling, 73, founder and president, Pattern Manufacturers Supply Co., Cleveland, died Sept. 24. Mr. Whaling founded the company in 1905 when he went to Cleveland from his native Rome, Pa.

William Borman, 57, foundry supervisor, Enterprise Brass Works Corp., Muskegon, Mich., died Oct. 5. From 1946-51 he was president, Borman Casting Co., St. Joseph, Mich. Previously he spent 13 years with Stewart Die Casting Div., Stewart-Warner Corp., Chicago.

Arthur T. Schuler, 79, one of the founders of Bucyrus Castings Co., Bucyrus, Ohio, died Sept. 26. Mr. Schuler served as mayor of Bucyrus from 1924-34.

Robert Ritchie, 69, chairman of the board of Jefferson Foundry Co., Birmingham, died recently. A native of Trenton, Ill., he went to Birmingham about 40 years ago. The company was founded in 1929.

Ayers Mineral Co. Celebrates Its Seventy-Fifth Anniversary

The year 1959 marks a milestone for Ayers Mineral Co., Zanesville, Ohio. Seventy-five years ago, Edward M. Ayers started mining and selling naturally bonded molding sand from deposits near Zanesville. During the intervening years he constructed and operated more than 20 mills in Ohio.

Ayers' original mill, built in Zanesville in 1903, reportedly was the first operation in the United States to mull, blend, and screen naturally bonded molding sands. Sands produced at this plant and at the company's Helmick plant were widely used by midwestern foundries.

To keep pace with the changing sand picture, however, Ayers Mineral built two modern naturally bonded sand mills at Lexington, Tenn., where a wider range of natural deposits exists.

Mr. Ayers also produced sharp silica sand in Ohio. The Central Silica Co., Glassrock, Ohio, and Millwood Sand Co., Millwood, Ohio, have been completely modernized in the last ten years to produce and ship high-grade silica sand and flour to Ohio foundries.

ATTENTION ALL GRAY IRON FOUNDRIES . . .

Now! HOT METAL
For Pouring Light and Difficult Castings—Available in the . . .
NEW U. S. "SKLENAR"
REVERBERATORY
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LOOK AT THE RECORD
Here's authentic performance data on 1000 lb. and 2000 lb. U. S. "Sklenar" Furnaces equipped with dual fuel burners, both melting gray iron for pouring light and heavy castings, with full charges consisting of one half pig iron, with balance in gates, risers and ordinary purchased scrap.

MELTING, FIRST HEAT:	1000 LB. FURNACE	2000 LB. FURNACE
TIME	45 min.	50 min.
OIL USED	21 gals.	45 gals.
GAS USED*	3150 cu. ft.	5835 cu. ft.
2ND HEAT:		
TIME	40 min.	45 min.
OIL USED	19 gals.	40 gals.
GAS USED*	2800 cu. ft.	5250 cu. ft.

*1030 BTU

Really hot metal . . .

of sufficient temperatures to pour light and difficult castings of excellent structure and machinability, with practically no rejects—that's the money-saving story behind the performance record of the revolutionary new U. S. "Sklenar" Reverberatory Melting Furnace. Innovations in combustion, design and construction, with patented features that contribute to faster melting, built-in economy of operation, and lower maintenance costs, are all yours in tomorrow's method of melting metals today!

Available in sizes ranging from 500 to 2000 lbs.—iron, brass and bronze (⅓rd these capacities for aluminum melting).

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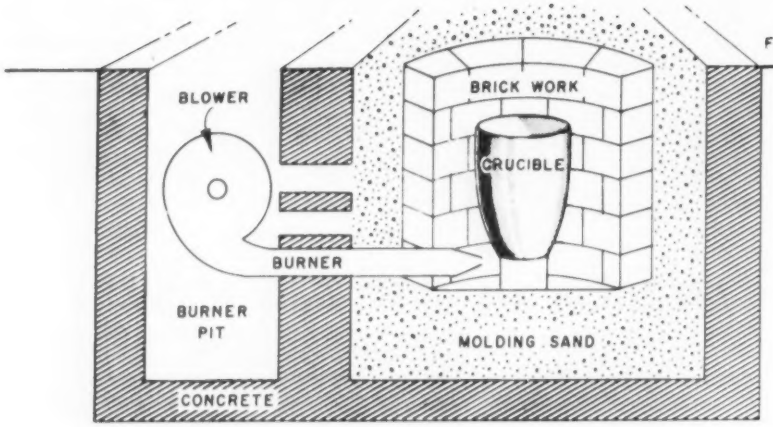
Trouble Shooting

By C. W. AMMEN



Drawing shows one way to solve space and capacity problems when extra melting capacity is needed occasionally. A pit which can be expanded or reduced as required provides a simple, workable solution

Flexible Melting Capacity

Dear Charlie:

We have three pits, each of which takes a No. 60 crucible, and for the most part they keep us supplied with sufficient metal. We get caught every now and then, however, with a casting that takes more metal than the total capacity of our three pits. We do not have enough large castings to warrant installation of a large furnace which would sit idle most of the time and take up a lot of space. Is it possible to melt red brass in a ladle? I know this procedure is used with iron.

Sincerely,
Sam

Dear Sam:

Of course, you should try to get enough big work to keep a big rig going if possible. At one shop where I spent some time, we used little pits, but every now and then got jobs like a big propeller or pump runner. We also had a great big, old melting rig which I guess ran about once a month, but when not in use, it sure was in the way.

There are many ways to solve space and capacity problems when you need extra melting capacity now and then. For example, a large pit furnace to take a big pot can be installed in an area flush with the floor level and covered with a suitable lid of steel or wood when not in use. In Mexico, some outfits build pits which can be expanded or reduced depending on the work or the amount of business. This arrangement is simple, yet workable.

A cement-lined, reinforced pit is constructed large enough to take the brickwork for a No. 400 crucible. Next to this pit is a rectangular pit in which the burner and blower are placed. A series of holes at various levels goes through from the burner pit into the furnace pit. Molding sand is rammed into the furnace pit, up to the proper height to make a foundation and bottom for the furnace, depending, of course, on the size chosen. The brickwork then is laid up.

The burner pipe is run through the proper hole and through the port provided for it in the brickwork. Molding sand then is rammed between the outer diameter of the furnace wall and the inner diameter of the pit, up to floor level. Put in a stool and a crucible, cover the setup with a cover tile, and you are in business. Most operators of these rigs simply use a No. 1 or No. 2 arch and splits to turn the proper diameter required. They use no refractory mortar.

Melting in a ladle is both simple and effective, but it requires a special dome-shaped cover with provision for entrance of the flame and for its exhaust. The ladle should be as shallow as possible—no deeper than the inside diameter. It is better, in fact, if the metal depth in the ladle is somewhat less than the inside diameter. A ladle can be constructed easily to give you the proper shape, which is very much like the hearth of a reverberatory unit and will melt good, clean heats like a charm. Firing can be done with either an oil or a gas burner.

Sincerely,
Charlie

Q. What's the difference between an archaeologist and a foundryman?

A. When an archaeologist thinks of AIRFLOATED CLAY, he thinks of LOESS, the fine dust that floats over the Gobi Desert.
When a foundryman thinks of AIRFLOATED CLAY, he thinks of

CEDAR HEIGHTS AIRFLOATED CLAY

Fundamentally, the raw product is a superior bonding clay; the finished product is a result of close laboratory control. CEDAR HEIGHTS AIRFLOATED CLAY is ground extra fine, ground to an almost unbelievable 200 mesh! Moreover, this fine bonding clay is made so carefully and packaged so well, it may be ordered and delivered any week of the year! We'll be happy to inform you the name of your nearest distributor. He also handles our top quality FIRE CLAY and BONDING CLAY. We believe you will find product, delivery and price equally satisfactory.

Ask your distributor or write to us direct for free samples of our products.

CEDAR HEIGHTS CLAY 50 PORTSMOUTH ROAD OAK HILL, OHIO **COMPANY**

Circle 664 on Page 53

57th Fall Meeting Held by

Steel Founders' Society

Society's technical research display is inspected by J. J. Ewens, Grede Foundries Inc., H. A. Forsberg, Blaw-Knox Co., C. W. Briggs, SFSA technical director, and W. H. Muchnic, LFM Mfg. Co.

G. K. Dreher, market development director, T. F. Dorsey, Pittsburgh Steel Foundry Co., F. K. Donaldson, SFSA executive vice president, and A. M. Slichter, Pelton Steel Casting Co., view market research display

Market development activities are discussed by R. A. Gezelius, General Steel Castings Corp., and M. J. Allen, American Steel Foundries

By WILLIAM G. GUDE
Managing Editor

● IT IS TIME for management to take the offensive in reducing costs and developing markets, members of the Steel Founders' Society of America were told at their 57th fall meeting. The meeting was held at the Homestead, Hot Springs, Va., Sept. 21-22.

President Ross L. Gilmore, president, Superior Steel & Malleable Castings Co., Benton Harbor, Mich., said that steel castings production had held up fairly well during the steel strike. He pointed out, however, that the industry's record in recent years in improving production per manhour and in cutting costs leaves something to be desired.

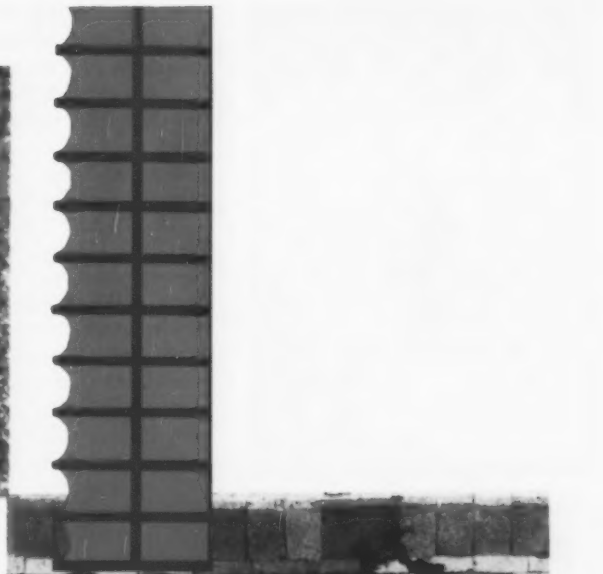
Significant features of the recently enacted Griffin-Landrum labor bill were discussed by Richard C. Moser of Patterson, Belknap & Webb, New York. He attributed passage of this measure to the changed attitude of the public toward certain labor activities, a change resulting partly from the Senate investigations.

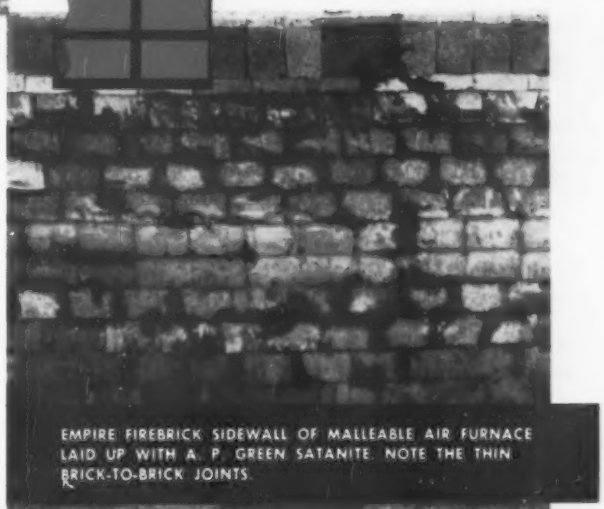
In citing some of the mistakes industry makes in its labor negotiations, Mr. Moser said that the worst is the use of unskilled negotiators. He also said that industry has been too reticent in publicizing its position during periods of labor disagreements.

Modern research should be considered as a business and operated as such, in the opinion of Dr. Max W. Lightner, vice president—applied research, United States Steel Corp., Pittsburgh. Speaking on "Looking Ahead in Steel Research," he said that research work must be continuous, not intermittent, because a lag is inevitable for results to show.

Although spending for research by industry has increased twelve fold while national income has tripled, there is no good answer to the question of how much an in-

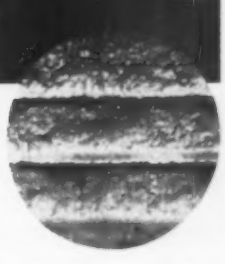
after 16 heats A. P. GREEN SATANITE joints protrude beyond the firebrick sidewalls





EMPIRE FIREBRICK SIDEWALL OF MALLEABLE AIR FURNACE LAID UP WITH A. P. GREEN SATANITE. NOTE THE THIN BRICK-TO-BRICK JOINTS.

SAME SIDEWALL AFTER 16 HEATS



CLOSE-UP SHOWING SATANITE JOINTS PROTRUDING 1/8 to 1/4" BEYOND SURFACE OF FIREBRICK.

A large midwestern foundry reports excellent results from furnaces in which A. P. Green SATANITE slag resisting mortar was used in laying up the sidewalls. The photographs clearly tell the story. A sidewall is shown immediately following installation and after 16 heats.

Note that after 16 heats, although the firebrick attacked by flame, slag and molten metal, has worn back several inches, the SATANITE joints still protrude 1/8 to 1/4 inch beyond the surface. This enables the wall to wear back evenly and give added joint protection. Protection that pays off in lower refractory cost, longer runs and increased production.

In malleable air furnaces where sidewalls and bottom are laid up with SATANITE, any part of them can be easily removed for patching or rebuilding. Use SATANITE bonding mortar to increase the life of the lining in all types of malleable iron air furnaces, ladles, electric furnaces, cupolas, and hot metal mixers. Packed in 100-pound multi-wall bags.

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REVECON: Non-crucible. Melts Monel, brass, bronze, aluminum, gray iron and high alloys. Sizes: 50 lbs. to 30 tons.

Progressive Foundrymen Choose

REVECON

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RAPID-MELTING FURNACES

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GUARANTEED

Low Metal-Melting Loss

Foundries are guaranteed a maximum 1% metal loss in aluminum and 2% maximum metal loss in brass at normal pouring temperatures. This means your furnace can pay for itself within one year. Special metal-melting loss demonstration in your foundry by our Mobile Demonstration Unit available on request.

Write for details on our Patented TAPPING VALVE for controlled pouring of bronze and aluminum.

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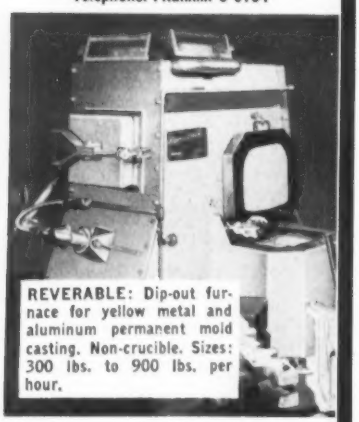
Telephone: FRanklin 6-0794


REVERABLE: Dip-out furnace for yellow metal and aluminum permanent mold casting. Non-crucible. Sizes: 300 lbs. to 900 lbs. per hour.

Canadian Representative: Drew Brown Ltd. 5410 Ferrier St., Montreal 9

Circle 667 on Page 53

dustry or a company should spend for such work. Rather, the question should be how much can you afford not to spend. Actually, research expenditures as a percentage of sales vary widely among different industries, being highest in the consumer goods field.

Dr. Lightner described some of the work being done at the new research center of U. S. Steel. It has some 1500 persons engaged in the study of new practices and products. Such investigations include conventional raw materials, direct reduction of iron ore, use of oxygen in the open-hearth furnace and blast furnace, vacuum melting, vacuum casting of ingots, and various other processes. Also among current studies is the development of ultra-high-strength steels. Building products and ceramic coatings have been subjects for applied research.

The speaker predicted further growth in oxygen use for steelmaking. Oxygen injection in blast furnaces also has proved successful in production of ferromanganese.

Government Meddling

Government would be empowered to meddle further in the management of private business had several bills introduced in the last session of Congress passed, it was pointed out by J. Keith Louden, executive vice president, Lebanon Steel Foundry, Lebanon, Pa.

These bills would have 1) required price reductions to all customers in the event a company cuts a price to one, 2) empowered the President to order investigations of price increases, 3) required a 30-day advance notice to the government of contemplated price increases, 4) required firms with assets of more than $10 million to notify the government 60 days in advance of a merger or acquisition of more than $1 million market value, and to open their books to government inspection, and 5) permit a company to sue another for what it considers to be unduly low prices.

Despite failure to pass, these bills are expected to be introduced again next year. They typify, the speaker said, a trend toward socialism which, along with crime and inflation, constitute today's principal problems. He urged more active participation, starting with the local level, in political affairs by every businessman.

Change will be the keynote of business in the 1960s, it was predicted by Dr. Pierre Rinfret, vice president, Lionel D. Edie & Co., New York. In discussing the long-term industrial outlook, he said that the growth industries of the next ten years will be different from those of the last decade.

Industry will be influenced not only by population growth but also by the change in sizes of various age groups. Industry is becoming more cyclical, with fluctuations in its activity likely to increase in number and rapidity.

Inflation will continue—at a rate of 1 to 1½ per cent a year rather than the galloping variety. Our large productive capacity will forestall the latter. Future economic growth will be less rapid than in the last ten years until about 1962-63, when it will be influenced by needs of the 18-24-year-old group.

Dr. Rinfret sees the following industries as the major growth industries of the 1960s: Home building, boating, water and sewage facilities, drugs, office equipment and business services, air transportation, electronics, electrical energy production, and aluminum.

Steel Founders' Society Plans T&O Conference

Steel Founders' Society of America will hold its 14th annual Technical and Operating Conference at the Carter Hotel, Cleveland, Nov. 9-11. Dale L. Hall, chairman of the National Technical and Operating Committee and works manager, Oklahoma Steel Castings Co., Tulsa, Okla. will be general chairman.

Dr. Arthur H. Sully

On Nov. 9, Dr. Arthur H. Sully, director, British Steel Castings Research Association, Sheffield, England, will present the annual exchange lecture on behalf of his organization. His talk will be "Dust Control and Noise Abatement," a subject which his association has investigated thoroughly.

The Monday morning session will

PURECO CO_2 QUICK-HARDENS LARGEST PROPELLER MOLD

19½-foot, 41,000-pound propeller cast in CO_2 hardened mold by a West Coast shipyard. No baking. No buckling. Sand re-usable. Machine shop costs reduced.

This is the largest propeller ever cast in the United States from a sand mold quick-hardened with Pureco CO_2.

The CO_2 process was employed, hardening the mold within minutes . . . compared to a former high-cost, baking process requiring up to 75 hours.

The Pureco equipment needed is simple and low in cost.

Your Pureco representative will be glad to arrange for a demonstration of the CO_2 process in your plant, or supply you with further information at no cost or obligation to you.

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A Division of Air Reduction Company, Incorporated

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Circle 666 on Page 53

PORTABLE TENSILE TESTER

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That Tests Wherever You Take It!

CAPACITIES FROM 2000 TO 40,000 LBS.

Pull tensile tests wherever you may be—in the shop or in the field, in the lab or on the line. Tests flat or round specimens, cast coupons or weld samples. Two simple, compact sizes. Light enough to be carried by two men; rugged enough to stand up under constant moving. Can be mounted on wall or bench according to space limitations.

Easily adjustable for specimens up to 2" wide, 12" long. Interchangeable wedge-type jaws readily inserted and adjusted. Load applied hydraulically by manual pump. Capacities up to 40,000 lbs. Cylinder stroke is 2½". Gage is 8½" OD, has maximum indicating hand.

Distributors in most major metalworking areas

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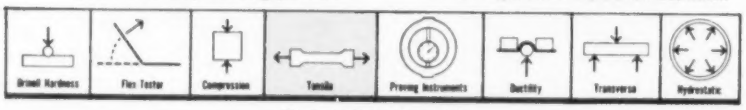
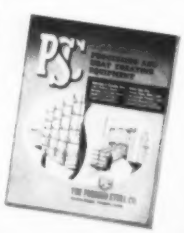


Circle 668 on Page 53

PSC's All-Sheet Construction Adds to Furnace Tube Life

Experience of users shows much lower frequency of burn-out, with tube life extended up to 100%. In PSC tubes, precision-welded bends are of same metal and thickness as the legs. The continuously smooth walls result in uniform flow of gas, and reduce the carbon build-up and bend burn-out, which commonly result from the rough interiors of cast alloy bends. Lighter than cast by 33 to 50%, PSC radiant tubes cost less initially. Any size, shape or alloy.



All Types Heat-Treat Units

THE PRESSED STEEL CO. • Wilkes-Barre, Pa.

Circle 669 on Page 53

be devoted to steel production and treatment, including vacuum degassing, use of special mold atmospheres, pouring rates, furnace design, and techniques of explosive hardening. Monday afternoon, in addition to the address by Dr. Sully, other operations in steel foundry finishing departments will be covered.

Tuesday morning will be devoted to molding methods, with discussions of latest developments in jolt-squeeze, diaphragm, and shell molding, as well as recent refinements in the CO_2 process. Olivine sand and possibilities of inorganic bonded molding materials will be discussed. The same topic will carry over into the afternoon session with attention to other special techniques and operations. The latter part of Tuesday afternoon will be devoted to open discussion.

A thorough review of the fundamentals of steel foundry sands will be covered by six major lectures through the morning and afternoon sessions on Wednesday, November 11.

Chicago Convention Covers Nondestructive Testing

"Product Reliability Through Nondestructive Testing" is the theme of the 19th annual convention of the Society for Nondestructive Testing. The meeting will be held Nov. 2-6 at the Hotel Hamilton, Chicago. More than 40 papers will be given by authoritative speakers, many concerning industrial applications of general nondestructive test methods, such as eddy current, radiography, ultrasonics, and magnetics.

The 1959 Lester Honor Lecture will be presented by Carl E. Betz, vice chairman of the board of Magnaflux Corp. The Lester Lecture is given biennially by some outstanding person in the field of nondestructive testing. Mr. Betz will discuss today's career opportunities for the nondestructive testing engineer.

Aluminum Smelters Institute Announces New Officers

At the annual election of officers of the Aluminum Smelters Research Institute, Chicago, Herman J. Galamba, Sonken-Galamba Corp.,

Kansas City, Kans., was named president, succeeding J. M. Stone, Aluminum Smelting & Refining Co., Cleveland. Dr. John P. Brull, North American Smelting Co., Wilmington, Del., was made vice president, and D. H. Warner, Aluminum & Magnesium Inc., Sandusky, Ohio, treasurer. Carl H. Burton continues as secretary.

SBA Aid Tells How To Set Up Quality Control Laboratory

Many small manufacturers are finding that quality control and technical development laboratories are essential for success, according to the Small Business Administration's *Technical Aids for Small Manufacturers*, No. 65.

These manufacturers often are surprised to learn that such labs are not complicated or costly to start. A one-man testing lab to check incoming materials can be the first step. Savings from improved uniformity in manufacturing conditions and product quality often can make a small laboratory self-supporting.

At the beginning, many small companies can justify a lab's expense only in terms of quality control. But in the long run, staying in business can depend on technical development.

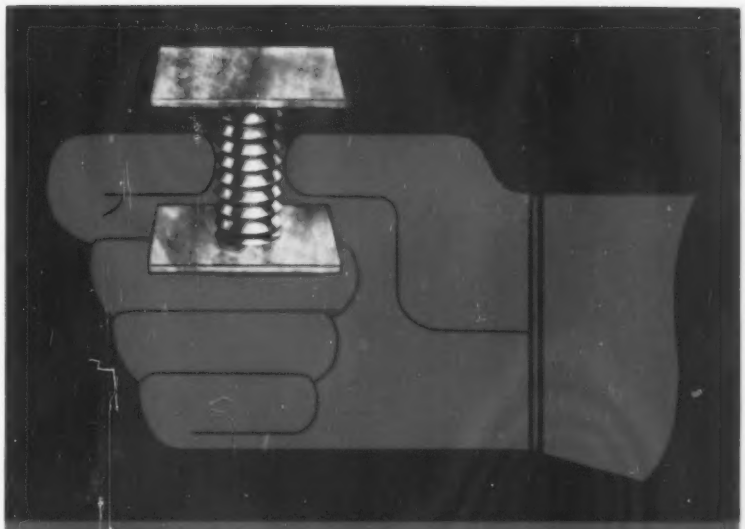
For free copies of the *Aid* on setting up a quality control and technical development laboratory, write to the Small Business Administration, Washington 25, D. C., or write any SBA field office.

Book Review

***Practical Ironmaking*, by G. D. Elliot and J. A. Bond, 276 pages, 6 x 9 in., published by the United Steel Companies Ltd., Sheffield 10, England. Price $6.**

This book has been prepared to serve the average operator of a furnace and the interested student of ironmaking. It is devoted primarily to the experience at one plant, but it is believed the underlying principles apply to all plants and practices.

The text deals with the following subjects: Design of the blast furnaces; cooling the furnace; maintenance; effect of coke quality on furnace operation; preparation of ores; sinter plant control; theory of the blast furnace; operation; stoves; refractories and slag.



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CHAPLET
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for every
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to insure better castings
to reduce scrap losses
to reduce labor costs

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Circle 670 on Page 53

Men of Industry

PHILIP C. DeBRUYNE
. . . Moline Malleable pres.

HARTLEY S. BALL
. . . City Pattern pres.

THOMAS W. TEETOR

ROBERT L. CLARK
Golden Foundry Co. appointments

Philip C. DeBruyne has been elected president, Moline Malleable Iron Co., St. Charles, Ill., succeeding **Gorton Fauntleroy,** who has become chairman of the board. With the company 23 years, he has been a vice president since 1949. Mr. DeBruyne was president of the Malleable Founders Society in 1957-58.

Walter V. Kovalick, formerly general manager, has been appointed director of manufacturing, Crane Co., Chicago. He joined the company in 1957.

Hartley S. Ball, vice president in charge of sales, has been named president, City Pattern Foundry & Machine Co., Detroit. He joined the company in 1948 as sales manager. Previously he spent 25 years with General Motors Corp., where he became superintendent of the pattern shop, Buick Motor Div.

Floyd R. Brown has been named vice president and director of marketing, Unitcast Corp., Toledo, Ohio. He was vice president and director of casting sales.

Thomas W. Teetor has been appointed general manager, and **Robert L. Clark** chief metallurgist, Golden Foundry Co., Columbus, Ind. Mr. Teetor resigned as general superintendent, Federal Malleable Co., Milwaukee, to enter the graduate school at Purdue University last year. Previously he was with Columbus Malleable Iron Co., Columbus, Ohio, and Swayne, Robinson & Co., Richmond, Ind. Mr. Clark spent over four years with the Oliver Corp., South Bend, Ind., and recently was chief metallurgist, Century Foundry, St. Louis.

Richard J. Gollmar has been named general manager, Elyria Foundry Div., Chromalloy Corp., Elyria, Ohio. He succeeds **Howard C. Gollmar,** who will continue as executive vice president and director of Chromalloy, and as consultant to the foundry. **Frederick S. Green** has been made assistant general manager and **Robert L. Gollmar** superintendent of foundry operations. Howard Gollmar became head of Elyria Foundry in 1946, and was a vice president of Industrial Brownhoist Inc., its former owner. He was president of the North-

HOWARD C. GOLLMAR

RICHARD J. GOLLMAR

FREDERICK S. GREEN

ROBERT L. GOLLMAR
changes announced by Elyria Foundry Div.

WITH TAYLOR ZIRCON RAMMING MIX

Mould Manufacturer cuts induction furnace lining costs by

50%

Pouring a heat of grey iron from 650 lb. high frequency induction furnace lined with TAYLOR ZIRCON No. 717 Ramming Mix.

TAYLOR ZIRCON No. 717 Ramming Mix has cut refractory lining costs *in half* for a mid-west mould manufacturer. In addition, average number of heats has increased. This company melts grey iron in 650 lb. and 1000 lb. induction furnaces to produce moulds for the glass industry.

Alert foundries are standardizing on TAYLOR ZIRCON Ramming Mix as the most economical lining for high frequency furnaces. High softening point, low thermal conductivity, high di-electric strength, and volume stability make TAYLOR ZIRCON an excellent refractory for this service. For detailed information, write direct, or call in a Taylor field engineer.

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Circle 676 on Page 53

ELMER A. RICH III

GEORGE O. PFAFF

appointments announced by Wheelabrator

R. GRANT WHITEHEAD

. . . heads Detroit Chapter

JOSEPH H. CADIEUX

. . . Casting Engineers pres.

eastern Ohio Chapter of the AFS in 1947-48. Richard Gollmar has served as production manager and assistant general manager and executive secretary of Chromalloy. Mr. Green started as a patternmaker and became pattern shop superintendent and head of foundry operations. Robert Gollmar was an apprentice molder at the foundry, and became assistant superintendent in 1951.

George O. Pfaff has been appointed director of marketing, Wheelabrator Corp., Mishawaka, Ind. He will continue to supervise abrasive sales. **Elmer A. Rich III** has been appointed vice president-general manager of Lake Erie Machinery Corp., Buffalo, Wheelabrator's new subsidiary. He was formerly general sales manager of the parent company. **J. F. Connaughton,** president of Wheelabrator, has also been named president and a director of Lake Erie Machinery Corp., succeeding **Robert E. Dillon,** who becomes chairman of the company's executive committee and consultant to Mr. Connaughton. **John M. Wolf,** controller of Wheelabrator Corp., has been named treasurer of Lake Erie Machinery Corp.

R. Grant Whitehead, elected chairman of the Detroit Chapter of the American Foundrymen's Society for 1959-60, is president, owner, and general manager, Dace Industries Ltd., Windsor, Ont., which he formed last year to manufacture and sell air handling equipment in Canada. For 18 years he was with Claude B. Schneible Co., Detroit, where he became secretary and sales manager. He represents the Schneible company and Vibro-Pneumatic Cleaner Co., Bronson, Mich.

Warren W. Brown has been named manager of market development, Massillon Steel Casting Co., Massillon, Ohio. Previously he was with Carondelet Foundry Co., St. Louis, and recently was sales manager. Superior Foundry Inc., Cleveland.

Joseph H. Cadieux has been named president, Casting Engineers Inc., Div. of Consolidated Foundries & Mfg. Corp., Chicago. For the last two years he was vice president of Casting Engineers. Previously he was vice president in charge of manufacturing for Misco Precision Casting Co., Whitehall, Mich., a former subsidiary of Consolidated Foundries.

Alexander D. Barczak has been appointed operational vice president, Superior Foundry Inc., Cleveland. **Ralph W. Barker** has been named general foundry superintendent of the Superior Foundry Div., and **Robert K. Kelly,** general foundry superintendent of the Allyne-Ryan Div. **Wallace R. Metzger** was made personnel manager, and **James R. Sims,** employment manager, of the Superior Foundry and Allyne-Ryan Divisions. Mr. Barczak, recently elected a director of the company, has been plant manager at Superior Foundry for the last ten years. Mr. Barker joined the company after eight years as melting superin-

RALPH W. BARKER

ROBERT K. KELLY

WALLACE R. METZGER

ALEXANDER D. BARCZAK

. . . appointments announced by Superior Foundry

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the abrasive wheel with the characteristics you want

SIMONDS CUT-OFF WHEELS

For cutting metals *and* costs, use these abrasive wheels. They are just about the quickest, most efficient way to cut all kinds of metal and non-metals, and, since Simonds makes them in all grain, grade and bond combinations, you are sure of getting the ones exactly suited to *your* needs.

Regular Resinoid bonded for the rigors of high speed operation. Borolon (aluminum oxide abrasive) for steel bars, tubes, angles, etc. Electrolon (silicon carbide) for cast iron, bronze, brass and non-metals.

Reinforced Resinoid bonded for added strength. Double XX wheels have the same fast action of ordinary resinoid bonded wheels, plus the extra strength of glass fiber reinforcement on both sides. For metals and non-metals, including all building materials except wood.

Regular Rubber bonded for wet or dry grinding. Ideal for cutting all materials under stress and strain. Because of their clean-cutting action, finishing operations can be eliminated.

Reinforced Rubber bonded for extra safety. For swing-frame cutting on gates, risers, etc. Available with (1) Standard Reinforcement; fiber glass on both sides (2) Double Reinforcement; reinforced internally in addition to both sides, or (3) Triple Reinforcement; two internal reinforcements in addition to both sides.

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Circle 672 on Page 53

ADAMS ALUMINUM EASY-OFF FLASK

Built for You in Any Length, Width or Depth

Make real savings from these advantages!

RIGID CONSTRUCTION from our proven corner design, permits less weight with no loss of strength.

SOLID CORNERS are of the same design used on Adams Aluminum Slip Flasks. This interlocking tongue-and-groove construction is retained in perfect alignment with bolts secured through tapped end sections and locked with washers and nuts. Important! This construction has proved far superior to other forms of corner design.

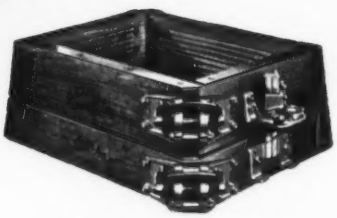
MALLEABLE TRIMMINGS are used on Adams Aluminum Easy-Off Flasks as on all other flasks we manufacture.

OPERATING MECHANISMS are identical with those used on the Adams Cherry Easy-Off Flask and incorporate the same simple adjustment and reversal of locking position.

STEEL PROTECTING STRIPS are standard equipment at top of cope and bottom of drag. Aluminum strips available upon request at no extra charge.

HANDLES AND TRUNNIONS are available when specified.

PIN AND EAR ARRANGEMENT available to interchange with present pattern plate guides.



Adams Cherry Easy-Off Flask

Adams Jackets, Cast Iron or Aluminum

Adams Steel Jacket

Write us today for further details . . Cherry Snap Flasks—Cherry Slip Flasks—Aluminum Slip Flasks—Easy-Off Flasks—Cherry Presser Boards—Wood Bottom Boards—Steel Bottom Plates—Steel Jackets—Aluminum or Cast Iron Jackets—Steel Bands—Steel Upsets—Cherry or Aluminum Upsets

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MOLDING MACHINES and FLASK EQUIPMENT

Circle 673 on Page 53

W. H. JOSEPH CLUFF
. . . retires, Frederic B. Stevens

CHARLES D. LOOMIS
. . . AFS chapter chairman

tendent of the Cleveland Foundry, Ford Motor Co., Berea, Ohio. Mr. Kelly formerly was chief inspector and foundry foreman at Superior Foundry Div., and assistant to the plant manager, Allyne-Ryan Div. Mr. Metzger has been personnel manager, and Mr. Sims, shop employment manager, of the main plant.

W. H. Joseph Cluff, since 1934, president, Frederic B. Stevens Inc., Detroit, has retired. He will continue as a consultant to the company and a member of the board of directors of the Udylite Corp., the parent company. Mr. Cluff started as a clerk in the bookkeeping department of an affiliate of Stevens in 1901, entered the company's sales department and became sales manager and later vice president. Active in the Detroit Foundrymen's Association and Detroit Chapter of the American Foundrymen's Society, he was a national director of the AFS in 1935-38. He was also vice president of the Foundry Facing Manufacturers Association in 1955. **Clyde H. Reeme**, president of the Udylite Corp., has succeeded Mr. Cluff as president of Frederic B. Stevens Inc.

Charles D. Loomis, chairman of the Rochester Chapter of the American Foundrymen's Society for 1959-60, is assistant foundry superintendent, General Railway Signal Co., Rochester, N. Y. Previous connections include Caldwell & Ward Brass Co., and Syracuse Foundry Inc., Syracuse, N. Y., and Goulds Pumps Inc., Seneca Falls, N. Y.

David D. Hunsaker, formerly a district manager, Frank G. Hough Co., Libertyville, Ill., has been appointed manager of sales development. He has been with the company 14 years.

Louis J. Pedicini recently joined Lester B. Knight & Associates Inc., Chicago, as project engineer. For the past year he has been manager of manufacturing engineering, Con-

DAVID D. HUNSAKER
. . . sales development mgr.

LOUIS J. PEDICINI
. . . joins Lester B. Knight

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NOMAD CAN SOLVE A VARIETY OF PROBLEMS — Whether you need to reduce man-hours per ton or get greater production from your present-sized labor force (or better yet, a reduced one), there is a "just-right" Nomad Conveyor System to fit *your* needs.

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NOMAD EQUIPMENT
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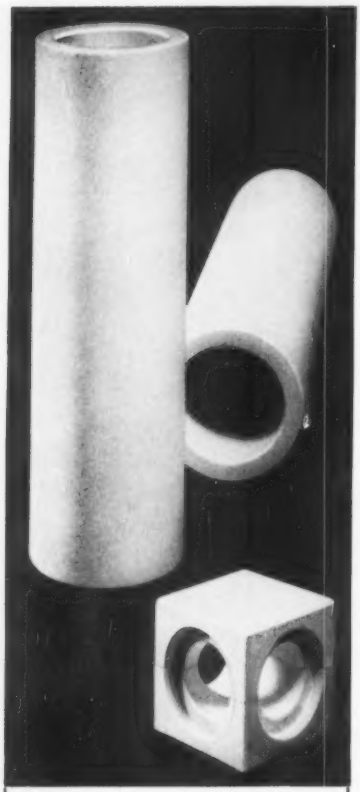

Louthan gate tiles cut foundry costs

You minimize casting problems, get cleaner castings when you use Louthan refractory gate tiles (elbows and tees to match). They prevent erosion of the gates in steel castings, safely withstand high temperatures, will not react with the molten metal. All popular diameters and lengths can be furnished.

Write for Free Gating and Risering Refractory Folder. Complete file of specifications on all Louthan products.

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MANUFACTURING COMPANY
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Circle 675 on Page 53

ANTON DORFMUELLER JR.

ROBERT J. MULLIGAN

. . . changes at Federal Foundry Supply Div.

gress Die Casting Div., Tann Corp., Detroit. Previously he was with Harry W. Dietert Co., Detroit, and General Motors Corp., where he became head of the Metal Castings Department. Mr. Pedicini is a national director of the American Foundrymen's Society and chairman of its Sand Division.

Anton Dorfmueller Jr. has been appointed assistant general manager, Federal Foundry Supply Div., Archer-Daniels-Midland Co., Cleveland. **Robert J. Mulligan,** formerly in charge of foundry products research and development, has succeeded Mr. Dorfmueller as general sales manager of the division.

Karl R. Braddock, formerly with Westinghouse Air Brake Co., Wilmerding, Pa., has been appointed sales representative in western Pennsylvania for Frederic B. Stevens Inc., Detroit.

Spencer S. Phillips has been named assistant manager of iron foundry service, Ohio Ferro-Alloys Corp., Canton, Ohio. Previous connections include Sibley Machine & Foundry Corp., South Bend, Ind., and International Harvester Co., Chicago.

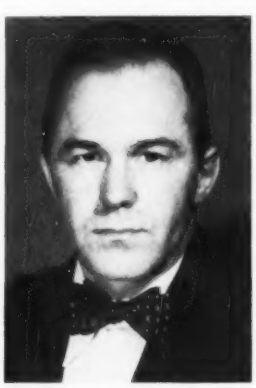
Chester J. Simmons recently joined the sales staff of Foundry Specialties Mfg. Co., Chicago. Previously he was with H. K. Porter Co. and J. D. Wilson Co., Chicago.

John Tatge has been put in charge of Industrial Oven Div. sales, and **Robert G. Martinek** has been named applications engineer for fuel-fired heat treating furnace equipment, Hevi-Duty Electric Co., Div. of Basic Products Corp., with headquarters in the Milwaukee home office. **John J. Toney** has been named New York sales engineer working from the New Jersey office.

Robert B. Fischer, chairman of the Metropolitan Chapter of the AFS for 1959-60, is metallurgist, Ingersoll-Rand Co., Phillipsburg, N. J. He has been with the company 19 years. Mr. Fischer is chair-

KARL R. BRADDOCK

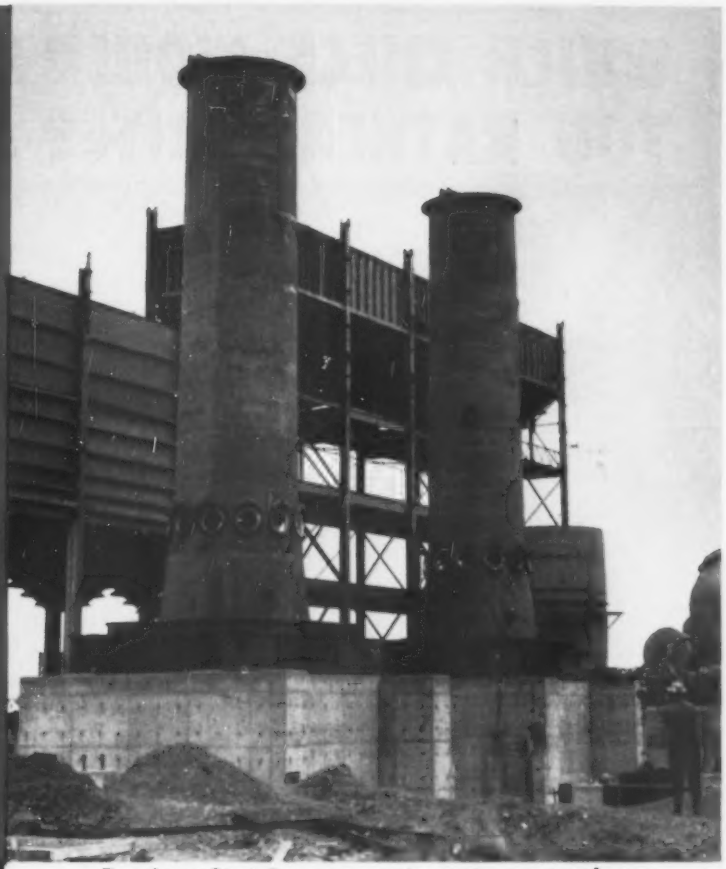
. . . joins Frederic B. Stevens



ROBERT B. FISCHER

. . . AFS chapter chairman

World's largest cupolas at Acme Steel Company use...



Two Acme Steel Company cupolas under construction.

Photo illustrates a temporary sub-assembly following machining of a section of the three-block-high "National" carbon well zone lining.

NATIONAL
TRADE-MARK

CARBON LININGS

These two cupolas will provide hot metal for Acme Steel Company's new oxygen converter plant at Riverdale, Illinois. Both of these cupolas measure 13 feet at the base plate and each will accommodate a 40-foot column of raw materials as compared to the 25 feet of a typical cupola.

These carbon linings — because of their chemical resistance and physical stability at high temperatures — permit extended campaigns without shutdown for lining repairs. This affords saving in maintenance materials and labor while maintaining production.

Here again is an outstanding example of the trend to carbon in cupola linings. Its resistance to attack from either acid or basic slag, low co-efficient of thermal expansion, and high strength at elevated temperatures make "National" carbon an ideal material for lining cupola wells, breast areas, front slagging spouts and slag dams.

"National" and "Union Carbide" are registered trade-marks of Union Carbide Corporation

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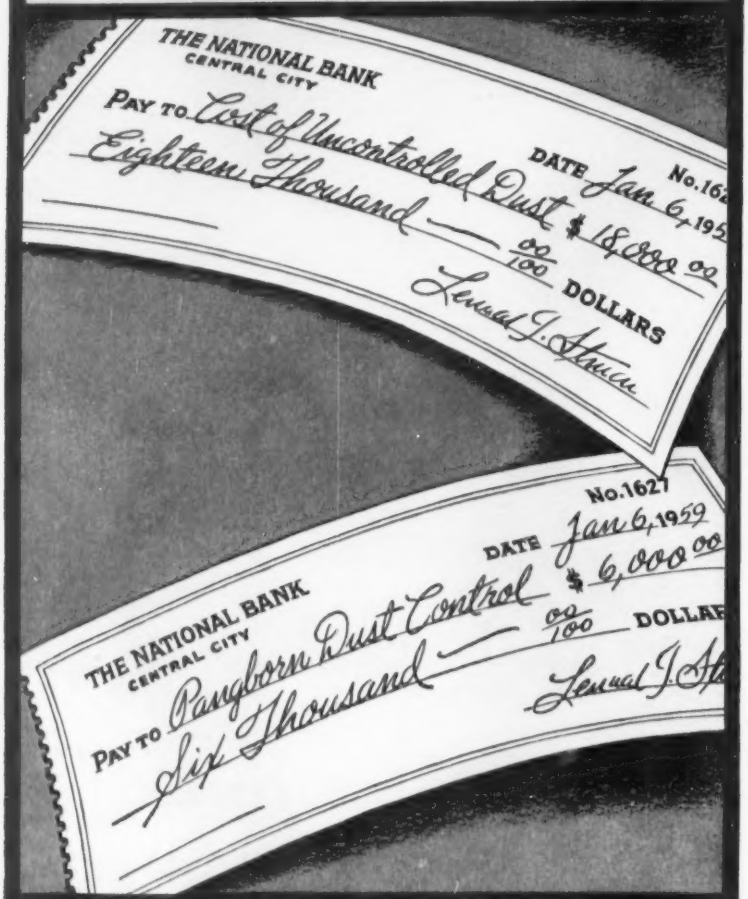


How much are you paying for uncontrolled dust?

See for yourself—add up the cost of your lost salvageable material, housekeeping expenses, excess machine wear, intangibles such as community and employee goodwill. Whether your total is moderate or high, Pangborn Dust Control will cost you *less* than uncontrolled dust.

For details on Pangborn's engineering knowledge and experience, talk to the Pangborn man in your area or write PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Maryland. *Manufacturers of Dust Control and Blast Cleaning Equipment — Rotoblast® Steel Shot and Grit.*

Pangborn CONTROLS DUST

man of the Brass and Bronze Division of the American Foundrymen's Society. He is a former chairman of the Lehigh Valley Chapter of American Society for Metals, and is a board member of the Lehigh Valley Foundrymen's Association.

Geoffrey Paget has been appointed chief metallurgist, Shaw Process Development Corp., Port Washington, N. Y., subsidiary of British Industries Corp. A veteran of 20 years in the metallurgical field, he is well known in Great Britain and Canada, as well as in the United States.

GEOFFREY PAGET
. . . Shaw chief metallurgist

R. James Swartout, since 1943 vice president and assistant secretary, has been elected president, Belle City Malleable Iron Co., and Racine Steel Castings Co., Racine, Wis. **Charles S. Anderson** was re-elected chairman of the board and named chief executive officer. **Bernard H. Regenburg** was re-elected vice president, secretary, and treasurer. **Hubert C. Cunningham** has been made assistant secretary, and **Robert D. Leutner,** assistant treasurer.

Louis M. Lund has been appointed Minnesota field representative, Federal Foundry Supply Div., Archer-Daniels-Midland Co., Cleveland, succeeding **Richard Szarz,** who has been assigned to additional service work in the Chicago area.

Wendell P. McKown has been appointed general manager, Centrifugally Cast Products Div., Shenango Furnace Co., Dover, Ohio, replacing **H. S. Ream Jr.,** who has been acting manager for the past year. Mr. McKown was formerly

general manager of the New Jersey Div., Kelsey-Hayes Co., Clark, N. J. Previously he was with Cooper Alloy Co., Hillside, N. J., as vice president-manufacturing.

Richard C. Trushel has been appointed sales representative in the St. Louis area, Ohio Ferro-Alloys Corp., Canton, Ohio. He formerly covered the Canton territory.

John J. Finnerty has been appointed Chicago sales representative, W. W. Sly Mfg. Co., Cleveland.

JOHN J. FINNERTY
. . . Sly Mfg. sales, Chicago

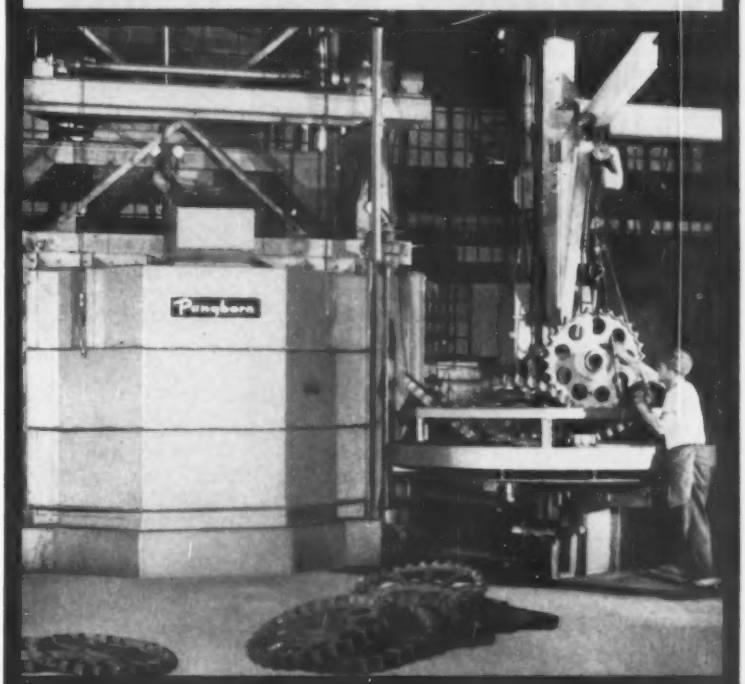
He joined the company's sales department two years ago.

Henry Davis Jr. has been named field sales manager of the mechanical goods division, United States Rubber Co., New York, succeeding **Matthew J. Delehaunty**, who recently became market planning manager for the division. **Douglas M. Smith** takes over Mr. Davis' former duties as eastern regional manager, with headquarters in the company's Passaic, N. J., branch office. Mr. Smith has been manager of hose sales in Passaic.

Richard D. Taylor, former Buffalo sales representative, has been appointed regional manager, Eastern Div., Techline Div., Wheelabrator Corp., Vicksburg, Mich.

Edwards G. Stanhope has been named New England district manager, Yale Materials Handling Div., Yale & Towne Mfg. Co., Philadelphia, with headquarters in Wellesley Hills, Mass., at Lee H. Long Associates. For 14 years he has been with Saco-Lowell Shops, Boston, where he was a sales co-ordinator and assistant to the vice president.

DOUBLES CLEANING CAPACITY!



Pangborn Table Room does twice the work at Harrison Steel Castings!

Two basic features of the new Pangborn "LM" Table Room at Harrison Steel Castings Co., Attica, Ind., explain the firm's doubled capacity in the cleaning department.

First: Twin work tables—one rotating in the blast cabinet while the other is reloaded—clean pieces up to 8' diameter continuously. These tables handle smoothly . . . are easily pushed by hand. Their weight while loading is supported by a stationary floor pedestal (rather than door hinges) for long life and trouble-free operation.

Second: The "LM" Table Room utilizes two Rotoblast wheels throwing a total of 100,000 lbs. of abrasive per hour. The result is a tremendous concentration of blast power for quick cleaning . . . positioned for complete, thorough work coverage.

The cleaning speed and operating ease of the Pangborn Table Room have proved the value of this machine at Harrison Steel Castings. If *you* must maintain production schedules in cleaning large, awkward or heavy pieces, send for Bulletin 805. Write PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Blast Cleaning and Dust Control Equipment—Rotoblast Steel Shot and Grit.*™

Pangborn

Cleans it fast with ROTOBLAST®

Circle 679 on Page 53

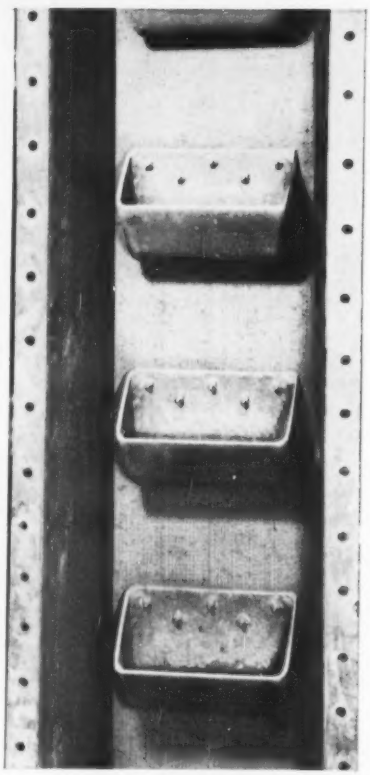
6 solid years of sanding couldn't wear it out

Imperial Belting makes another tough job easy

When the OPW Corporation of Cincinnati installed their foundry sand handling system in 1952 they came right to Imperial for the elevator belting it required.

The Imperial patented INNER-LOCKED* Belting we supplied has given outstanding performance in a tough foundry operation involving continual abrasion, constant stress, and periodic choke-ups. But, let the folks from OPW tell you about it . . .

"The original Imperial Sahara* Belt is still in good condition and appears to have considerable more life left in it. However, it is our policy to replace certain types of equipment before they wear out. A second belt we've ordered will be installed this year, at which time the original belt it replaces will have given us seven years of trouble-free service."



IMPERIAL BELTS COST LESS TO USE

Imperial's 50 years of belting experience have resulted in our exclusive INNERLOCKED* construction and the perfection of special impregnating compounds for belting that's unequalled in its field. Because Imperial belts last longer, they offer you substantial dollar savings.

Ply separation is prevented and stitches will not run even if a thread is cut or torn. All Imperial belting is manufactured with a special heavy-duty hard silver duck . . . duck which has greater strength and longer wearing qualities that are far superior to the base materials used by other belt companies.

You'll find a longer-wearing Imperial belt specifically designed for any of your needs . . . sand elevating, metal parts conveying, handling hot or cold castings, hot bulk materials, and many other jobs.

A letter or a phone call will bring you specific details on the many types of Imperial heavy-duty belts that are job-designed to perform your conveying and elevating jobs better at less cost to you.

*INNERLOCKED—Registered trademark of Imperial Belting Company.
*SAHARA—Registered trademark of Imperial Belting Company.

You expect more from Imperial . . . and you get more!

Imperial 50 YEARS 1909-1959 Belting Co

Imperial BELTING COMPANY

1750 SOUTH KILBOURN AVE. • CHICAGO 23, ILLINOIS

Metal Show Scheduled for Nov. 2-6, in Chicago

The 41st edition of the National Metal Exposition and Congress of American Society for Metals will be staged in Chicago, Nov. 2-6. Theme of both show and congress is "Materials and Fabrication Preview of the Soaring '60s." The exposition will be held in the International Amphitheatre, with technical sessions in several Chicago hotels. ASM headquarters will be at the Hotel Sherman.

Nearly 400 exhibits will occupy 300,000 sq ft of space in the Amphitheatre and adjoining Exhibition Hall. Technical sessions will offer hundreds of engineering and scientific presentations including papers, seminars, panel conferences, lectures, and personal participation sessions.

Among recent developments to be seen by Metal Show visitors in exhibits and to be explored at the technical sessions are advances in high-strength steels, composite materials, superthin stainless steel, alloy strip, vacuum melting, and many others. Many Metal Show exhibits will be displayed in special industry sections.

New York University Offers Course on Air Pollution

An intensive two-week course on air pollution is being offered by New York University for any persons concerned with the problem of community air pollution.

Topics to be covered include economic factors, toxic emissions, micrometeorology, applications of meteorology, air pollution surveys, sampling and analysis, air cleaning equipment, odor assessment and control, incineration, internal combustion engines, power plants, pollution control in specific industries, effects of air pollutants on vegetation, government regulations, and public relations. A field trip to Brookhaven National Laboratory also is included.

The course will be given full time Nov. 30 through Dec. 11. Tuition is $100. For applications and further information, write to the Office of the Associate Dean, New York University Post-Graduate Medical School, 550 First Ave., New York 16, N. Y.

MALLEABLE FOUNDERS SURVEY ACTIVITIES

Discuss Society Program at Cleveland

● FALL meeting of the Malleable Founders' Society, held at Cleveland, Sept. 18, featured a discussion of state taxation of interstate commerce by Fred Woodbridge, partner, Jones, Day, Cockley & Reaves, Cleveland.

He first outlined the several recent decisions of the United States Supreme Court, including the Stockham Valves & Fittings case, which opened the way for states to tax interstate commerce where sales offices were maintained or where salesmen or "missionaries" were sent in to call on customers.

Mr. Woodbridge said that the federal statute passed by Congress on Sept. 3 and signed by the President on Sept. 14 freezes the situation on the basis of the Stockham case. It prohibits the states from imposing a net income tax on business where there is only solicitation. The statute is not retroactive, however, and makes no provision for taxes already paid.

While the statute is stopgap, it provides for establishment of a committee to make a full study of the income record of business in interstate commerce. Mr. Woodbridge suggested that each company engaging in interstate commerce study this important situation carefully.

Hans J. Heine, technical and research director, reported on some impressions of foundry practice in Britain and West Germany, gained on a trip he made recently to those countries.

He described particularly the remarkable research work being done in both countries, and indicated that nothing in this country approaches the activity in scope, facilities, or money spent. He stressed the need for much greater attention to research in this country if we are to keep step with progress in competing industries, or with the foundry industry in other parts of the world.

Lowell D. Ryan, executive vice president, pointed to the need for a trade association to undertake long-range planning, and then outlined in detail the impressive program of MFS for the next five years. This can be divided into three categories: 1. Promotion. 2. Research and Product Development. 3. All others.

Mr. Ryan indicated that the highly successful promotion program of the Malleable Castings Council will be continued during the coming year. The direct mail program, "Malleable Iron Facts," which has been well received by users for many years, will be continued. The society expects to distribute the new *Malleable Iron Handbook* in 1960, and a committee will assess the value of the new book and start developing a new edition.

Mr. Ryan also outlined the program of the society in the collection and distribution of economic data, development of specifications, the research program in the field of machining, basic properties, and development of heavy section malleable castings. In the general category, the society will add emphasis to the importance of plant safety as a means of reducing costs. A Financial Planning Conference is scheduled for this fall.

An interesting movie, "Toward More Effective Shell," produced by the Army Ordnance Corps at Albion Malleable Iron Co., Albion, Mich., was shown. Comments on the film were exceptionally complimentary.

Twentieth Anniversary of Apprenticeship Council

Foundrymen of the San Francisco Bay area joined with management and labor recently when the California Apprenticeship Council returned for its twentieth anniversary meeting to Oakland, site of its organization. Members of the council were guests of these groups at a ceremonial meeting and banquet.

Northern California foundrymen have been instrumental in encouraging young men to enter the molding and coremaking trades as apprentices. At present there are 100 such apprentices registered in the state. During the last 14 years, a total of 350 apprentices completed their training in these fields.

Orefraction®
ZIRCON
Sand and Flour

® THIS TRADEMARK HAS BECOME A HALLMARK

To those in the Foundry Industry, this trademark, long the symbol of Orefraction, has become the Hallmark of Zircon.

Like the word Sterling is to Silver, Orefraction is to Zircon. It assures purity, uniformity and dependable service.

REMEMBER — THERE'S NO BETTER ZIRCON THAN OREFRACTION ZIRCON.

Write for NEW FOUNDRY INDUSTRY DATA SHEET AND NAME OF YOUR OREFRACTION DISTRIBUTOR

Orefraction MINERALS INC.

P. O. BOX 247 ANDREWS, S. C.

Around the Country

NEWS REPORTS FROM

Chicago . . . Philadelphia . . . Boston . . . Pittsburgh

Boston— Fourth quarter melt by iron foundries will be 10 to 15 per cent larger than in the third quarter and but for the steel strike the increase would be somewhat higher. Most gray iron shops are operating five days a week. Backlogs are not extended, with few exceptions two to three weeks; malleable foundries average slightly more.

Textile mill equipment units are melting about 60 per cent above last year; five of the largest textile machinery builders, three in New England, are approaching 2000 tons of castings weekly. Machine tool demand for castings also is improved, mostly supplied by jobbing shops. With few exceptions machine tool builders in New England no longer operate captive shops.

Producers of castings for the building industry, including highway drainage equipment, have depleted substantial stocks and are pushed to meet current orders. Foundries in this category usually build up stocks for the out-door building season.

Nonferrous shops are operating close to 15 per cent over third quarter, notably brass and bronze. Orders from valve, meter, and plumbing users are more active and some foundries have built up moderate backlogs. Hersey Mfg. Co., Dedham, Mass., operating a new mechanized bronze foundry (completed 1957) is merging Jan. 1 with Sparling Meter Co., El Monte, Calif. Some diversification in product is planned as a result.

Pig iron prices for fourth quarter are unchanged at $68 per gross ton, f.o.b. Everett; there is some stiffening in foundry cast scrap grades.

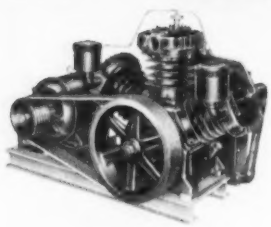
Pittsburgh— With few exceptions, foundries here have been in the doldrums. Steel industry suppliers have had no new orders for weeks, awaiting settlement of the labor dispute.

In some cases, steelmakers did not release orders because their clerical employees were on strike. But in most instances they held off because of heavy third quarter losses. What's more, castings ordered before the strike and scheduled for delivery at its conclusion will keep them running for quite a while without reordering.

Most foundries are operating at 45 to 60 per cent of capacity. In the absence of new orders, they're

Where the going is TOUGHEST the Curtis keeps going!

Sandiest FOUNDRY conditions haven't stopped this CURTIS AIR COMPRESSOR



The CURTIS C-100 two-stage air-cooled air compressor. 25-30-40 H.P.

- CURTIS-SEAL CRANKCASE
- TIMKEN MAIN BEARINGS
- SELF CENTRO-RING OILING
- AIR COOLED: NO COOL WATER REQUIRED
- PRECISION BUILT

For compressed air—industry depends on *Curtis*. Eliminate production line delays. Get more air faster . . . at lower cost. Where the going is toughest (foundry, factory or shipyard) put the CURTIS C-100 to work and forget it!—Full line of industrial compressors for ordinary and special applications.

For complete information write for illustrated folder.

OUR 105th YEAR

Curtis

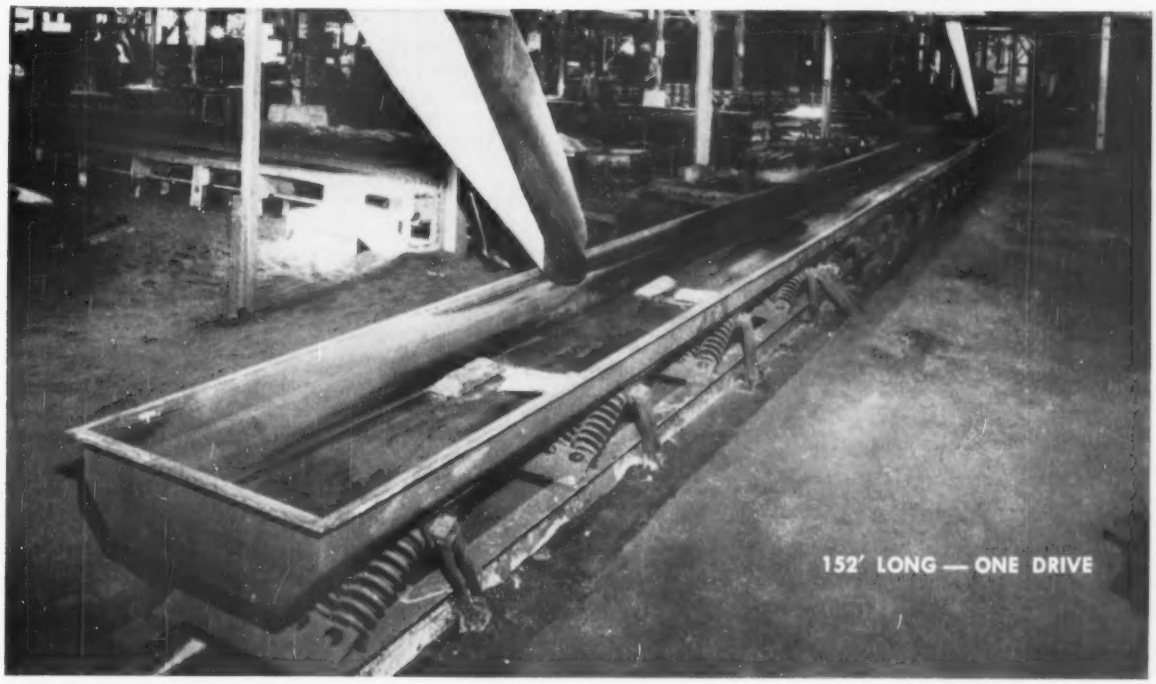
MANUFACTURING COMPANY · PNEUMATIC DIVISION

Write Dept. 42, St. Louis 20, Missouri C-62

RUGGED ▶ VERSATILE

Impact of hot sand, castings no problem.

Built-in shakeout with lump-breaker separates sand and castings.



IN NASHVILLE FOUNDRY:

Special Shakeout-Conveyor lowers handling costs

This Carrier Natural-Frequency shakeout conveyor—152-feet long with a single 30 H.P. drive—has been installed in the foundry at Phillips & Buttorff Manufacturing Co., Nashville, Tenn., to replace a system of hand shakeouts and belt conveying.

Result: The new Carrier Conveyor has greatly reduced labor costs, equipment downtime and sand spillage. It produces cleaner castings, requires less manpower and generally provides a more efficient operation than was previously possible.

Once the requirements were outlined by Phillips & Buttorff's engineering department, Carrier custom-designed this conveyor to improve the system for handling sand and castings. The conveyor's simple, rugged construction plus a special built-in shakeout section are perfect examples of Carrier's versatile engineering service.

CARRIER

~~NATURAL-FREQUENCY~~

VIBRATING EQUIPMENT

Engineering Specialists in Vibrating Equipment

Write for Foundry Equipment Bulletin: Carrier Conveyor Corporation, 225-A North Jackson Street, Louisville 2, Kentucky

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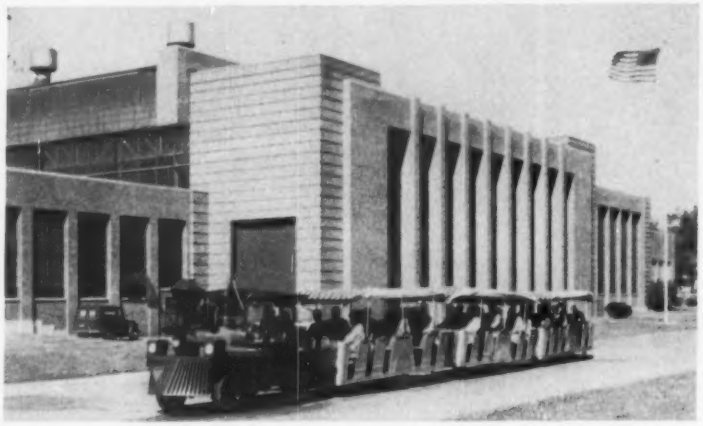


ANNIVERSARY: Cincinnati Milling Machine Co., celebrating its 75th anniversary, recently took visitors on a day-long "Adventures in Progress" tour of its Cincinnati plant. It also was the occasion for the unveiling of 20 new machine tools. Shown here is miniature train carrying some of the guests as it passes the CMM foundry en route to the Products Div. building devoted to manufacture of grinding wheels and cutting fluids

producing for inventory. Some of the steel and gray iron shops have gone about as far with stockpiling as they dare. Financial resources are strained, and there's no more room for storage.

Since the strike started, monthly shipments of one steel industry supplier have dropped 90 per cent. Fearing a "terrific" shortage of railroad cars after the strike, a company official predicts that it will be "weeks and weeks" before shipments get back to normal. September shipments of a nonferrous foundry that makes acid-resistant castings for the steel industry were 75 per cent below par.

Foundries that supply railroad car builders are singing the blues because their customers can't get plates and structurals and consequently refrain from ordering more castings. Says a foundry sales official, "It will be six to eight weeks after the strike is settled before the car builders have enough steel. Until then, we won't be able to resume volume shipments."

Although they're pessimistic at the moment, producers of railroad castings look for a big upturn by the end of the year and near record shipments in 1960. "Next year, the carriers will have some of the biggest repair and replacement programs we've seen in a decade," a foundryman predicts.

Roll manufacturers have curtailed operations and laid off some of their employees. Having made all of the rolls that were originally scheduled for third quarter delivery, they're producing only for the smaller steelmakers who negotiated contract extensions.

Among the few foundries here that are operating close to capacity are those producing railroad castings (they're building inventories), automotive parts, heavy press castings, and ordnance items such as tank turrets.

ABRASIVES LABORATORY: H. F. Kulas, general technical advisor, Cleveland Metal Abrasive Co., Cleveland, adjusts the lens of a new Unitron machine installed in the company's recently completed laboratory. The device enlarges and develops pictures of metal shot and grit to determine the structure. It magnifies up to 2000 times and develops photographs in only 60 seconds. Cleveland Metal Abrasive also broke ground recently for a 16,000-sq-ft addition to cost $350,000

Philadelphia— While there still is a definite lack of heavy work, demand for light and medium castings is holding up well.

In gray iron this is reflected in a wide diversity of requirements for agricultural, textile, and material handling equipment; also for pump work, valves and fittings, power transmission machinery, and, to some extent, building construction.

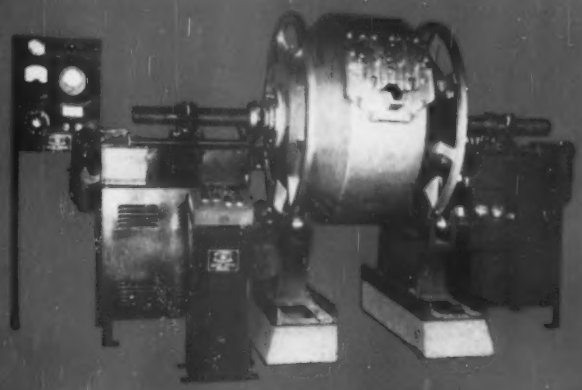
Gray iron job shops have been operating four to five days a week (mostly five) and would have been going at a better rate had it not been for the unsettled labor situation in steel.

Steel foundries are somewhat more active, operating at five days in some cases. However, lack of heavy capital goods requirements is felt, with a result that it is pretty much touch-and-go with most shops. Backlogs range around three to four weeks.

Most malleable foundries are operating five to six days a week, with

GET FASTER, CLEANER MELTS

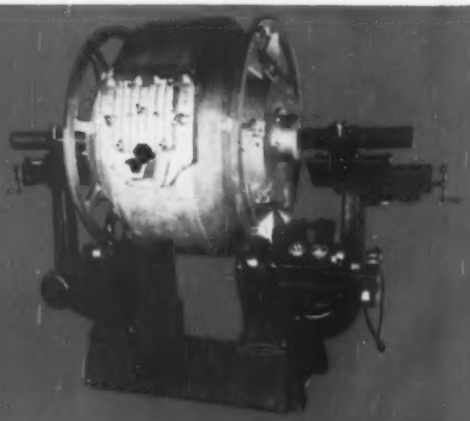
with Detroit indirect arc furnaces 10 through 4000 lbs.



350-4000 LBS. CAPACITY
PEDESTAL-MOUNTED ELECTRODES

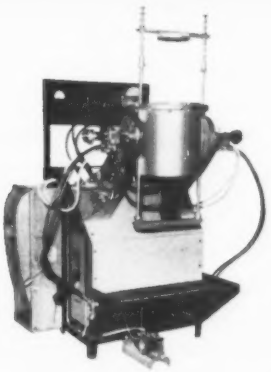
These larger capacity furnaces, with their pedestal-mounted electrodes, are especially suited to rear loading. Electrode carriages are mounted on the pedestals, which also house the automatic electrode control and automatic rocking control. Motor driven electrodes allow automatic control or push button adjustment from any station.

Some of the advantages of Kuhlman indirect arc rocking furnaces are: fast melting, efficient use of power, no contamination of melts, close control of analysis.



60-700 LBS. CAPACITY
BASE MOUNTED ELECTRODES

Base mounting of electrodes, used in Detroit Rocking Furnaces in capacities from 60 to 700 lbs., allows greatest flexibility in the locating of electrical leads. Overhead electrical work can be entirely eliminated. With electrodes rigid and stationary in their mounts, precise alignment is maintained. When electrodes are withdrawn, the shell is free and may be removed for quick replacement.

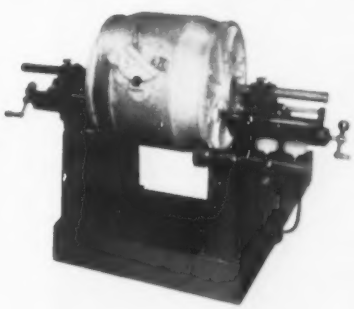


Investment Casting Furnaces

Type IC: 12 Kw., 10 lb. Type ID: 20 Kw., 20 lb. Specially designed for the investment casting of precision parts. Fast, indirect arc melting and direct casting from furnace to clamped-on mold. Both furnaces can be equipped for pressure casting and inert gas melting. Optional equipment also includes adjustable motor driven rocking and roll-over control for uniform melting and casting.

Type PT—Pot Tilting

12 Kw., 15 lbs. capacity. A useful furnace for research and small production jobs. Cover swings aside for loading and pouring. Pot can be carried as crucible or tilted to pour on stand. Requires as little as 25 sq. ft. of floor space.



GMS series—for versatility

3 models ranging from 40-100 lbs. capacity. Used for research, quality control and specialty production. Offers automatic control, uniform melts—the same quality features found on our larger furnaces.

For full information, write

DETROIT ROCKING ELECTRIC FURNACE This is our 41st year

Division of Kuhlman Electric Company, Bay City, Michigan

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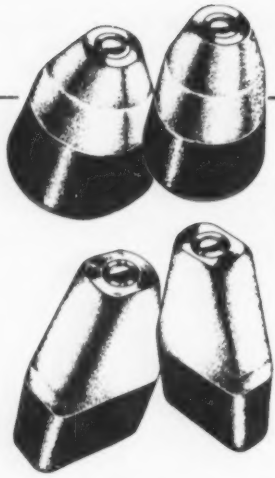

Cut Your Costs And Save Your Patterns With Arrow Butts And Peins . . . featuring replaceable rubber tips.

Over one half million have been used with complete satisfaction. Send for catalog on complete line of butts and peins. We feature 13 types. Sand rammer butts are our business, not our sideline.

Arrow BUTT COMPANY
4800 W. 139th St., Cleveland 35, Ohio

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Cut casting costs, eliminate shrinkage, reduce scrap with

Foseco® FEEDEX®

exothermic anti-piping compounds for increased feeding efficiency

This bulletin tells you how. Send for your free copy today.

Foseco®
FOUNDRY SERVICES, INC.
P. O. Box 8728, Cleveland 35, Ohio

Circle 686 on Page 53

tonnage going mainly into pipe fittings, building hardware, materials handling equipment, and truck and automotive components.

Independent brass shops are down from the summer average. Some are working only two and a half days a week and certain others are operating every other week. Some captives, though, are doing very well, especially those engaged in the production of plumbing supplies, water meters, and industrial valves and pumps. Aluminum shops continue exceptionally busy with orders for a variety of purposes.

Chicago—Of 53 Chicago high school prize winners in Ford Motor Co.'s 13th annual Industrial Arts Awards competition, nine were in the patternmaking and molding division.

Among winners in this division were David Eby, $100, first award, bevel gear, Lane Technical High School, L. Woodruff, instructor; Daniel Gesiakowski, $80, second award, cast iron anchor, Chicago Vocational High School, Willard Newton, instructor; Robert Riccomi, $60, third award, pattern and corebox for drill press, J. Sterling Morton High School, Paul R. Rohe, instructor; and James Ozimek, $40, fourth award, cast bronze spur gear, Lane Technical High School, Fred H. Dix, instructor.

Honorable mention and $20 went to Karl Koschnitzke for a sheave pulley, Michael F. Rapp for a brass bell casting, and Kenneth Wehde for a cast iron pipe elbow, all of Lane Technical High School and Fred H. Dix, instructor; Helmut Laumer for a horse casting, Lane Technical High School, L. Woodruff, instructor; and Stanley J. Cherney, for pattern and corebox for base, J. Sterling Morton High School, Paul R. Rohe, instructor.

More than 45,000 junior and senior students in the United States, Canada, and Mexico, competed for the more than 1500 individual awards totaling $50,000.

With the Industrial Arts Awards program an annual event, interest develops as to what influence the winning of an Outstanding Achievement Award might have on the youths' future education and selection of employment.

According to Don Healas, Industrial Arts representative, Ford Motor Co., Dearborn, Mich., Wayne State University in 1955 completed a study on this subject covering the years 1950-53. Of 77 Outstanding Achievement Award winners questionnaired, 60 replied.

The survey showed: 1. Participants' background differed greatly; 2. Participants' activities included junior high, senior high, college, employment and armed forces; 3. Hobbies were in 53 areas; 4. Over 50 per cent had home workshops; 5. Majority working were in the technical field; 6. Over 48 per cent of those eligible were in college and only one was not pursuing a technical course.

A second study covering 1954-58 is being made under the same auspices and returns still are coming in. Questionnaires were sent to 154 youths.

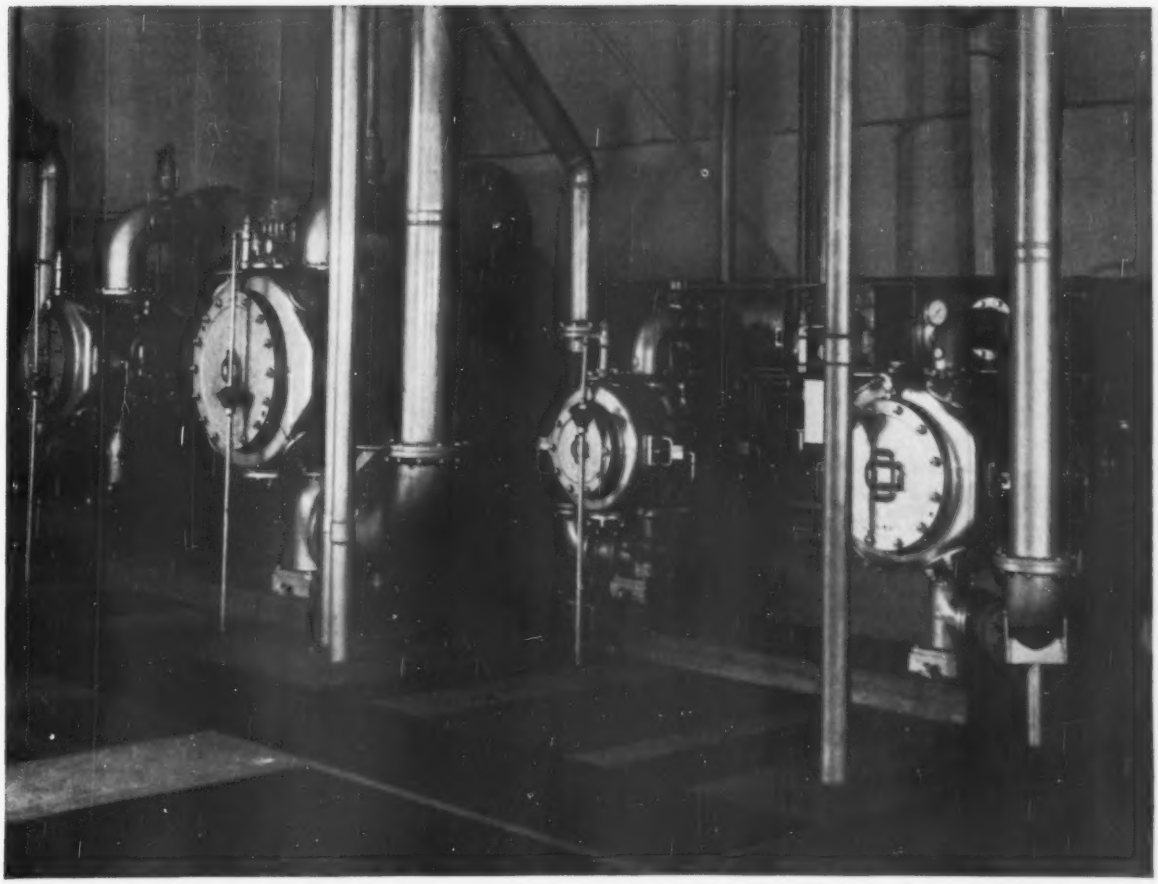
Announces Regulations for AFS Apprentice Contest

The Robert E. Kennedy Memorial Apprentice Contest, sponsored annually by the American Foundrymen's Society, opened Oct. 1 and closes April 8, 1960. The contest has been conducted annually since 1924.

Any apprentice, learner, or trainee in the metal castings industry who has not had more than five years of patternmaking experience or four years of molding experience is eligible. AFS membership by either the contestant or his employing company is not required. The amount of apprentice training or other training has no bearing on eligibility and is not considered in the judging.

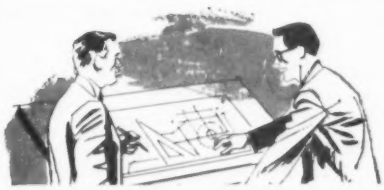
Cash prizes of $100 for first place, $75 for second place, and $50 for third place will be awarded winners in these contest divisions: Gray iron molding, nonferrous molding, steel molding, metal patternmaking, and wood patternmaking. Certificates of recognition also will be presented to winners. First-place winner in each division will be invited, with round-trip travel expense paid, to attend the society's annual convention in Philadelphia, May 9-13.

Official rules and regulations and additional information can be obtained from R. E. Betterley, educational director, AFS, Golf & Wolf Roads, Des Plaines, Ill.



New Gardner-Denver HAF compressor (left) now supplies all air for a large plant. HAC (right) was retained as a stand-by unit.

How to modernize your plant with a planned compressed air system



IN INDUSTRY—SPEEDING THE PACE,

the Gardner-Denver specialist is an integral part of the team. He works side by side with engineers and designers, helping to solve their problems, for at Gardner-Denver there's no substitute for men—our 100-year philosophy of growth.

In a sweeping modernization of its compressed air system, a large Midwest foundry recently replaced several small, power-eating compressors with *one* large Gardner-Denver HAF. The new unit is 23 & 13½ x 14, delivering 1750 cfm. Now the plant has a *planned* compressed air system—resulting in considerable power saving, and efficient air flow throughout the plant.

Even though the new HAF supplies all the air for normal plant operations, a Gardner-Denver HAC with a capacity of 750 cfm was retained as a stand-by unit. Other steps in the modernization included installing a new air receiver and a new, larger 8″ air line.

It'll pay you to take a close look at *your* compressed air. You may find modernization with a planned system a big cost-saver. A Gardner-Denver compressed air specialist will gladly look at your entire system—your compressor installation, your distribution system, your air uses and your maintenance of air tools. He can recommend the best solution to any compressed air problems you may have.

GARDNER-DENVER Since 1859 — 100 YEARS 1959

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

Circle 687 on Page 53

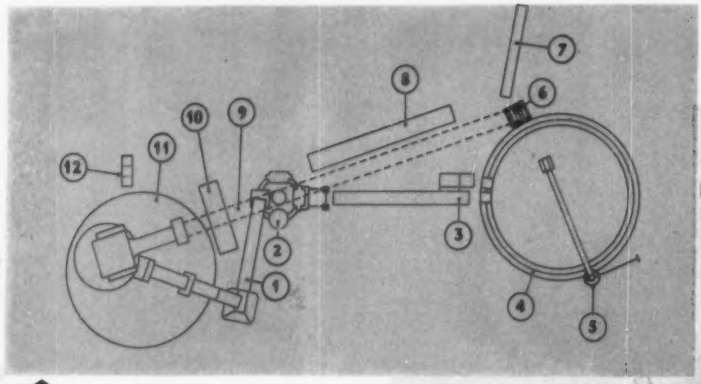


Fig. 1—Schematic diagram shows layout of a typical unit. Floor area is 30 x 60 ft: 1. Sand feed conveyor. 2. Molding machine. 3. Coring conveyor. 4. Rotary mold conveyor. 5. Pouring mechanism. 6. Shakeout. 7. Casting delivery conveyor. 8. Flask return conveyor. 9. Underground sand return conveyor belt. 10. Magnetic separator. 11. Sand reconditioning plant. 12. Control panel

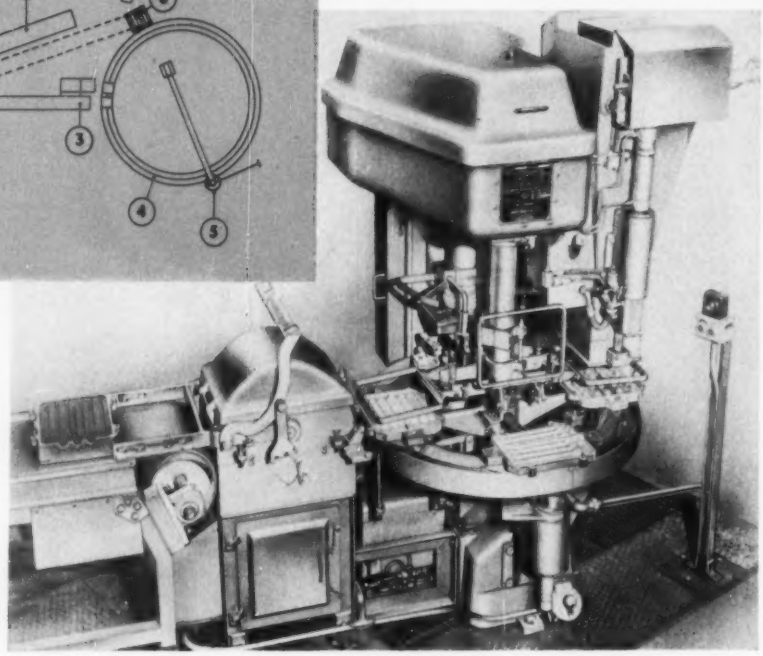


Fig. 2—Automatic molding machine is the heart of the system

Small Flasks Employed in

Automatic Molding System

By H. B. HALLSWORTH
Development Director
Platt Malleable Castings Ltd.

R. D. MILLIS
Manager, Foundry Equipment Dept.
Rubery Owen & Co. Ltd.

and

PETER SPEAR
Director of Research
Rubery Owen & Co. Ltd.

● THE Hallsworth automatic molding system, a British development, uses relatively small, easily handled flasks with completely automatic equipment. Fig. 1 is a schematic diagram which shows the layout of a typical unit, several of which are in operation in England.

The system is flexible to facilitate the use of a number of pattern plates within a single shift without any more adjustments than can be undertaken by a semiskilled mechanic.

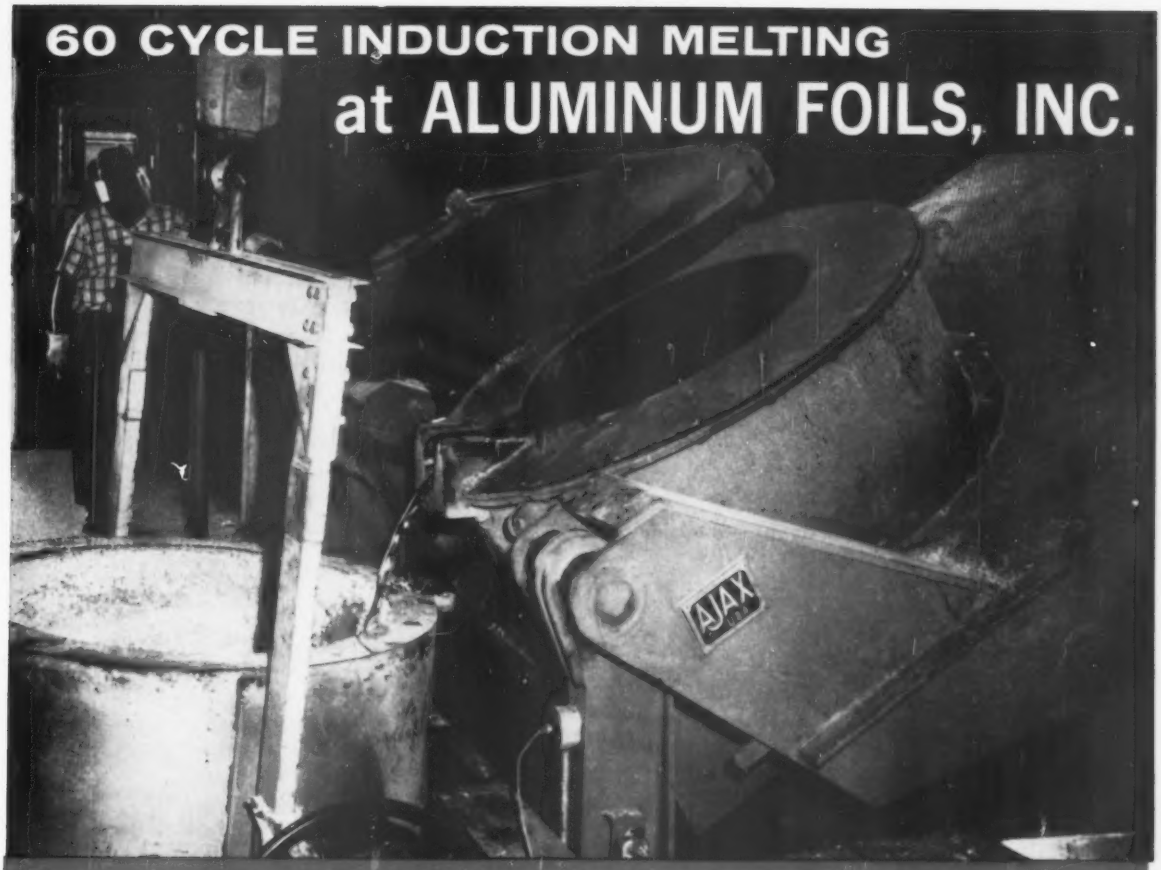
The system centers around an automatic molding machine, Fig. 2, which sprays parting, charges a flask with sand, edge tucks, squeezes, removes surplus sand, strips the mold, and deposits it on a conveyor track to be assembled. This sequence is carried out on a four-station machine served by a number of auxiliary appliances keyed to its operational sequence. The molding machine is capable of producing at least 240 completed molds per hour. Flask size is 12 x 9 x 5 in.

Sequence of Operations — The molding machine consists of four stations and a rotary table or track which automatically conveys flask half and pattern from station to station. At the first station, the operator locates the flask half on the pattern plate and pulls the vertically positioned, hinged sand-allowance frame down onto the flask. The table indexes to the second station and in its arc of movement is subjected to a spray of parting fluid.

Then a semirotary hopper turns through 180 degrees, discharging sand into the flask. A frame fitted to the sand chute moves down, compressing the sand around the edge of the mold. The table next indexes to station No. 3 for the main squeeze operation. During this movement, the filled flask passes under an adjustable sand-leveling device which strikes off surplus sand.

After the squeeze, the table indexes to station No. 4. As it does so, the hinged sand allowance frame is restored to the vertical position

60 CYCLE INDUCTION MELTING at ALUMINUM FOILS, INC.



AJAX-JUNKER Coreless 60 Cycle Induction Furnace

Economically Melts Aluminum Foil, Chips, and Sawings.

The 700 kw AJAX-JUNKER coreless induction furnace at the Jackson, Tenn., plant of ALUMINUM FOILS, INC. — specialists in high-quality aluminum foil, coiled sheet, and super-purity aluminum pig — is the largest unit of its type in operation in this country. With a total capacity of 7000 lbs of aluminum, the furnace is capable of melting 3200 lbs per hour.

The AJAX-JUNKER furnace at this company melts plant scrap consisting of foil, scalper chips, and sawings, materials requiring special attention when using conventional furnaces. With the AJAX-JUNKER furnace and its strong inherent stirring action, no labor is required for 'puddling'. One man controls the entire operation.

Average metal losses are below 2% in this installation where experience with other furnace types showed average losses of over 6%. Accurate temperature control, dependability, and uniformity of alloy composition are further features of this unit. ALUMINUM FOILS are also producing hardener alloys directly from plant scrap with a minimum of effort and a maximum of alloy accuracy.

The AJAX-JUNKER 60 cycle induction furnace is an ideal tool for many different applications, melting ferrous and nonferrous metals. Our engineers will be glad to study your melting requirements. Write to AJAX ENGINEERING DIVISION, Trenton 7, N. J., for Bulletin R 58.

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P.O. Box 1418 • Lalor & Hancock Streets
Trenton 7, New Jersey

Circle 688 on Page 53

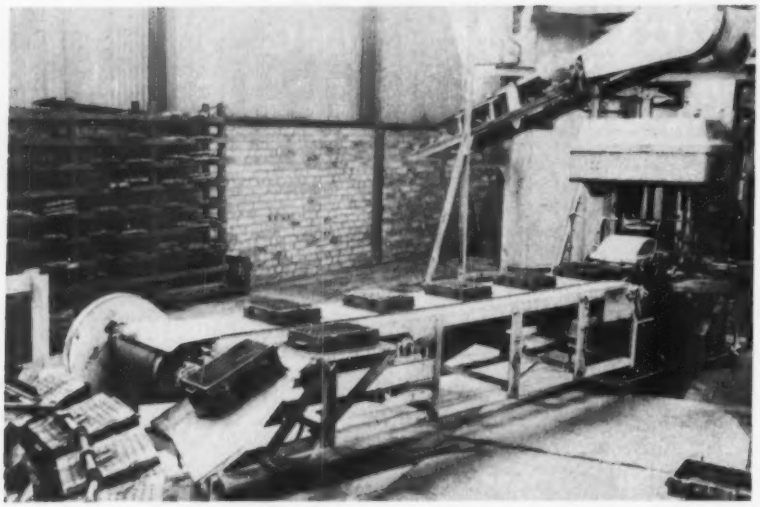


Fig. 3—General view of coring conveyor shows half molds in transit and closed mold on slipway to rotary conveyor. Courtesy Charles Perk Ltd.

to enable the scraper bar to strickle the mold. The pattern plate is vibrated, and the mold is stripped and is removed by the takeoff arms. The cycle is completed when the takeoff mechanism places the half-mold, face upward, on a moving belt conveyor.

All operations described take place simultaneously, and four flasks and patterns are in use at the same time.

Presence of an operator is required, but he has only three relatively simple functions: 1. Visually examine pattern plate and clean it with an air gun if necessary. 2. Position the flask half. 3. Bring down the sand allowance frame. All molding operations are carried out automatically.

Core setting—Simple core setting is carried out while the molds are in motion on the coring conveyor, Fig. 3, on their way to the rotary track. If more complicated coring is required, semicircular tables are positioned to the side of the coring conveyor, onto which the operator pulls the matching mold halves. He sets the cores, closes the cope mold, and replaces completed molds on the conveyor.

Rotary Conveyor—The completed mold is loaded manually into the rotary conveyor (Fig. 4). To reduce operator effort, a slip is provided at the end of the coring conveyor down which the boxes slide into the next pallet, or mold clamping mechanism. From this point, the mold is handled mechanically. The mold clamping mechanisms are carried on the outer ring of the rotary track. Each unit consists of a base with a spring-loaded top and is mounted in pivots about the bottom pallet between two upright supports. Molds are poured vertically.

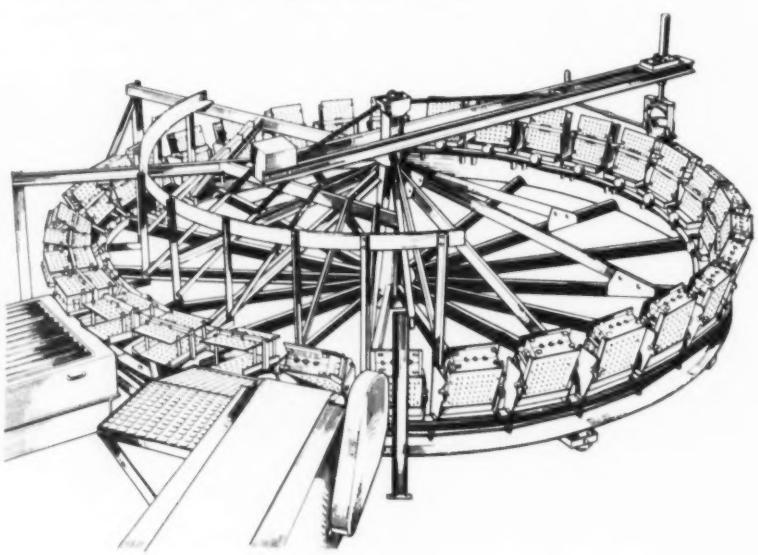
Pouring—Clamping arrangements resist ferrostatic pressure and prevent any possibility of metal leakage. After a mold has been poured, the track takes the pallet around with no change in angle. During this period, in which the cast metal is solidifying, no vibration occurs. Speed of the track has to be controlled to enable the casting to solidify completely, and this requirement in turn controls the whole clamping, pouring, and shakeout cycle. The track is wire-rope driven from a variable speed gearbox and electric motor. After cooling, molds are automatically restored to the horizontal position and unclamped, ready for removal at the shakeout.

To pour molds vertically, it is advisable that the ladle lip be kept as close as possible to the downgate and that the ladle height be adjusted about its lip during pouring. In this system, standard foundry ladles are used, but the carrying handle is modified.

Ladle and carrying handle are supported in a self-adjusting cradle suspended from a swinging arm so that the ladle moves around an arc, the center of which coincides with the center of the rotary track. The cradle consists of two hooks and is supported by a compression spring working in a housing which permits rotary and vertical movements and also allows the ladle to be moved in or out as desired.

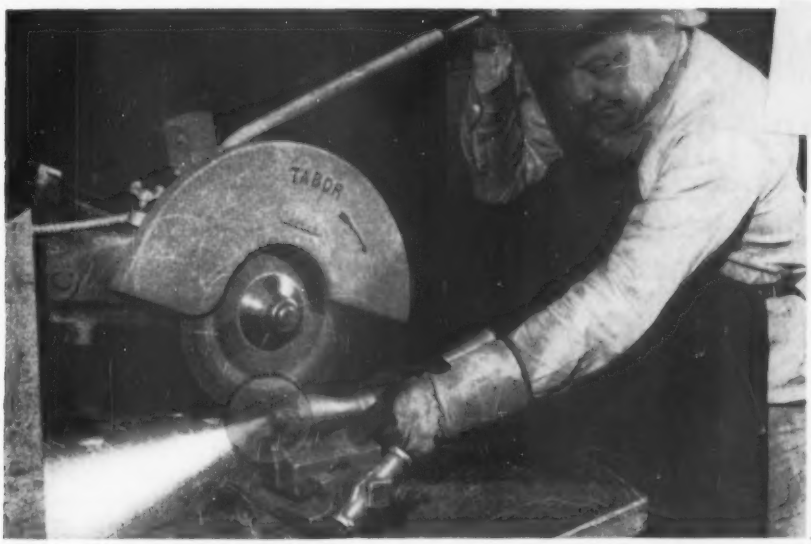
The arm from which the mechanism is suspended rotates about the center of the mold conveyor. A balance weight is fitted at the opposite end to facilitate rotation and eliminate operator fatigue. The ladle handle is provided with two trunnions, one on each side of the

Fig. 4—View of the rotary casting conveyor shows the positions of the mold pallets at various stages of its rotation



Foundry favorites for non-ferrous cutting-off

Norton BN and RN reinforced wheels bring you extra strength, safety and the cost-cutting "Touch of Gold"



BN . . . Time-Proved and Top-Ranking

Glass Cloth Reinforcement, Resinoid Bonded. Long popular for safety and durability, BN wheels are unequalled for cutting-off gates and risers on non-ferrous castings — also for nicking, slotting, deburring, and light snagging. This wide job range means you can use BN wheels on table type, swing frame, bench stand, pedestal or portable grinders. Where thinner wheels than the standard BN type are needed, such as on portable machines, the new type BNA wheel is recommended — available in thickness 1/16" and 3/32" up to 10" diameter.

RN . . . Newest Money-Saver

Glass Cloth Reinforcement, Rubber Bonded. Made with the strength, long life and safety built into the entire Norton reinforced wheel family, the RN is a new, faster and freer cutting, low-priced foundry economizer. It will pay you to investigate how the Norton RN is reducing costs in non-ferrous cutting-off.

W-1908

Your Norton Distributor will be glad to demonstrate BN, RN or other Norton wheels in your foundry — or to call in your Norton Abrasive Engineer for expert aid in solving any of your grinding problems. Get this prompt, worthwhile service — soon. NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

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Circle 689 on Page 53

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. . . for strong, dense, uniform castings from every melt!

Reduce scrap rejects, misruns, cold-shuts . . . achieve consistently high quality castings! Marshall Enclosed-Tip Thermocouples indicate instantly and accurately "when" to pour brass, bronze, aluminum, or magnesium melts. Frequent, regular, exact temperature readings help avoid shrinkage porosity, gas porosity, dross . . . produce better casting finishes . . . control aluminum grain size.

Dependable, easy-to-use Marshall Thermocouples *take interior temperatures deep within the melt.* Tip can be stirred to speed reading, giving *true temperature in about 20 seconds.* Pyrometer always indicates *steady, accurate reading.* Thermocouple wire can't become contaminated from melt or short-circuited by slag. Tip withstands scores of immersions before replacement is necessary. Mail coupon for catalog today!

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Furnace Type (above) . . . lengths up to 10 ft., for use with Stationary Pyrometer.
Ladle Type (left) . . . for use with Portable Pyrometer.

L. H. MARSHALL CO., 270 W. LANE AVE., COLUMBUS 2, OHIO

Please rush Catalog which fully describes Marshall Enclosed-Tip Thermocouples!

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ladle, which pivot within the two hooks of the cradle. The cradle support spring is loaded to equal the combined weight of the cradle handle assembly; consequently, it adjusts its height as the metal poured reduces the total weight of the assembly.

Shakeout—The shakeout is a conventional, vibratory, frame-type machine fixed to the foundry floor and positioned over an underground sand-return conveyor. Flasks are placed on a gravity roller conveyor, indicated in Fig. 1, for return to the molding machine and completion of the cycle.

Sand Processing — Used sand is carried by the underground conveyor beneath a magnetic separator to remove foreign ferrous material. It then is discharged into a bucket elevator and raised to a rotary screen above the storage hopper. Beneath the storage hopper is a measuring hopper or feeder gate for discharge of a given quantity of sand into the mill. To meet variations in sand conditioning requirements, the system can be equipped with the sand mill best suited for the specific need and can be either continuous or batch type. Whatever type is provided, the sand cycle is controlled automatically by electrical sequence control gear.

Flexibility—As described here, the molding machine is capable of producing at least 240 complete molds per hour. The speed of the circular clamping and pouring conveyor track is variable to provide a cooling period of from four to eight minutes, depending on molding machine output, type of alloy, and casting section.

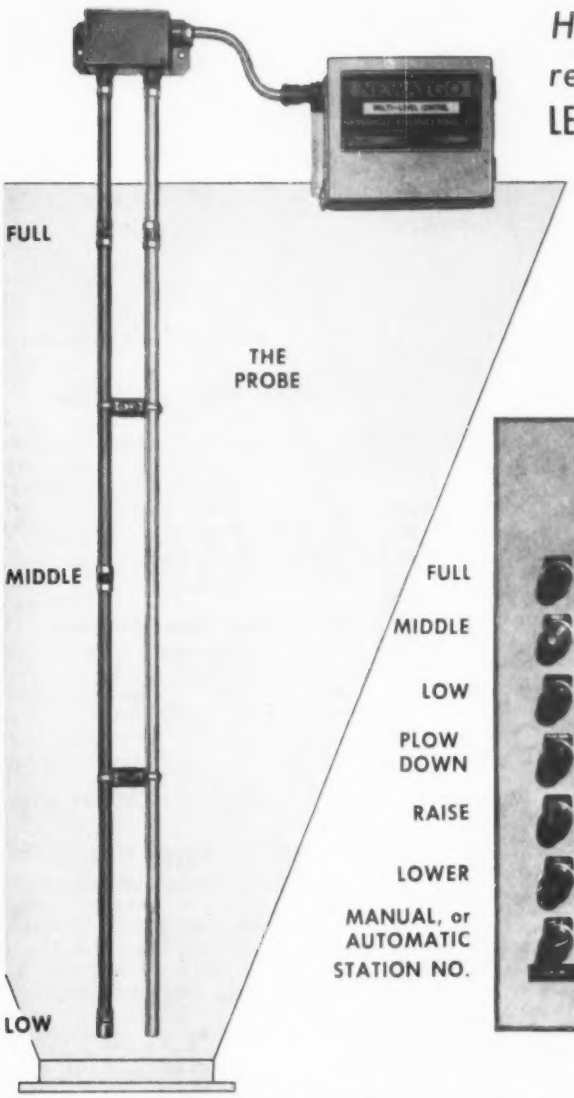
It is not always necessary for a foundry to install all the equipment described. Many foundries are equipped with adequate sand reconditioning facilities, for example, and it is necessary only to insure that a steady, controllable flow of correctly conditioned sand reaches the molding machine hopper.

Again, although the setup described has been arranged to give reasonable line flow, it can be grouped to suit a shop of almost any shape and to meet local requirements. Any of the conveyor tracks, for instance, can be made available in any length or shape without altering the basic concept of the plant.

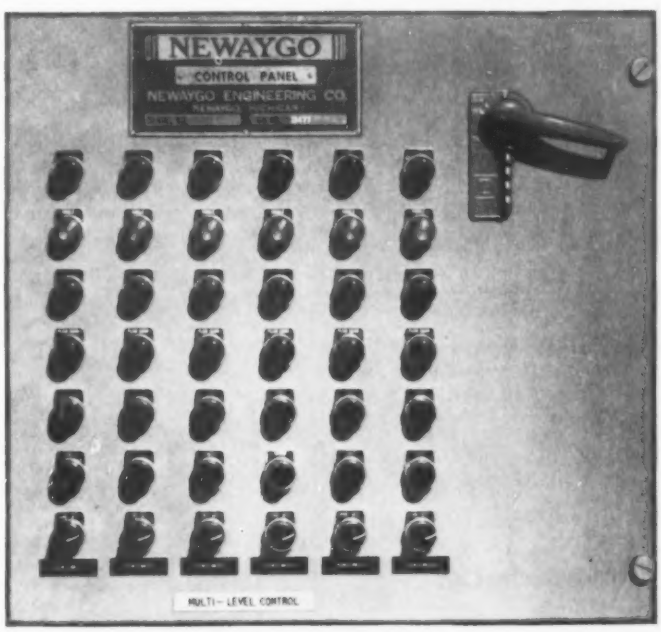
Newaygo's New MULTI-LEVEL CONTROL

ASSURES CONTINUOUS SUPPLY OF SAND TO MOLDERS BY AUTOMATIC SAND DISTRIBUTION

Here is the "heart" of this system for reporting and controlling **3 OR MORE LEVELS OF SAND** *in hoppers or bins.*



THE CONTROL PANEL



This new, improved system of MULTI-LEVEL CONTROL, by a Probe in each hopper, reports and controls 3 or more levels of sand automatically. This Multi-Level Control operates the hopper plows automatically or manually for any or all stations as required, which is another unique feature of this system. The mixer man can tell depth of sand in hoppers instantly, and control it automatically, eliminating another man to watch and report levels to him. This additional unique feature of the new Multi-Level Control is that special mixes for any one station can be controlled manually by the mixer operator, independent of other stations, which remain on automatic setting. *Write, wire or phone for complete details of this newest Newaygo-designed Multi-level Control system.*

NEWAYGO engineering company
NEWAYGO, MICHIGAN

Do you receive "SAND SCRIPTS"? Write us, if you want to receive this Newaygo Magazine.

Circle 691 on Page 53

Literature for Foundrymen

For More Information Use Reply Card—Page 53

Portable Air Tools

How to get more productivity from portable air tools and thus cut costs is the subject of this handbook. The book examines average situations that are practical to the shop man. Air pressures, maintenance, and selecting the right tools for the job are the main approaches to increasing productivity.—**Rotor Tool Co.**, 26300 Lakeland Blvd., Cleveland 32, Ohio.

For More Details Circle No. 406—Page 53

Snagging Wheels

Bulletin ESA-305 describes grinding wheels for rough snagging operations on floor stand, swing frame, and portable grinding machines, including straight wheels, cup wheels, depressed center wheels, and abrasive cones. Specifications charts are included.—**Simonds Abrasive Co.**, Tacony and Fraley Streets, Philadelphia 37, Pa.

For More Details Circle No. 407—Page 53

Fork Truck Fuel

Advantages of liquefied petroleum gas as a fork truck fuel are discussed in a brochure. Comparisons between the operating characteristics of LP gas and gasoline, examples of savings, and sketches illustrating construction features are included in the brochure.—**Industrial Truck Div., Clark Equipment Co.**, Battle Creek, Mich.

For More Details Circle No. 408—Page 53

Low-Carbon Ferrochrome

Six-page folder cites solubility examples for fast dissolving low-carbon ferrochrome for stainless steel. Advantages, uses, analysis, and grades are listed.—**Union Carbide Metals Co.**, division of Union Carbide Corp., 30 E. 42nd St., New York 17, N. Y.

For More Details Circle No. 409—Page 53

Portable Gas Heaters

Catalog 259B features company's line of salamanders, blower heaters, and infrared heaters.—**Insto-Gas Corp.**, 998 E. Woodbridge St., Detroit 7, Mich.

For More Details Circle No. 410—Page 53

Safety Mitt

Reversible, interchangeable safety mitt with four-way design is described and illustrated in Bulletin 611A.—**Keller Glove Mfg. Co.**, Plumsteadville, Pa.

For More Details Circle No. 411—Page 53

Dust Collector

Hydro-Filter dimensions, specifications, and capacity data are included in a bulletin which also describes the operating principle of this wet-type dust collector.—**National Dust Collector Corp.**, 700 Machinery Hall, 549 W. Washington Blvd., Chicago 6, Ill.

For More Details Circle No. 412—Page 53

High Alloy Secondary Metals

Various methods and types of equipment for processing high alloy secondary metals are presented in this 16-page brochure. Photos show steps in processing, packaging, and research facilities.—**Frankel Co., Inc.**, 19300 Filer Ave., Detroit 34, Mich.

For More Details Circle No. 413—Page 53

Thermocouples

Complete information about this company's line of thermocouples and thermocouple components and accessories is described in Catalog EN-S2. Recommendations are given on the choice and use of thermocouples and assemblies and on limitations of protecting tube and well materials.—**Leeds & Northrup Co.**, 4934 Stenton Ave., Philadelphia 44, Pa.

For More Details Circle No. 414—Page 53

Air Control Valves

Bulletin 235 covers the alternate bases and integral speed control section for this company's series CC 4-way air valves. Dimensions and specifications also are given.—**Hannifin Co.**, division of Parker-Hannifin Co., Dept. 238, 501 S. Wolf Rd., Des Plaines, Ill.

For More Details Circle No. 415—Page 53

Did You Miss These?

Here is a list of popular literature items offered in recent months:

SILICON IN CAST IRON—Ohio Ferro-Alloys Corp., Canton, Ohio. Circle 401, Page 53

FLEXIBLE MOLDS (Brochure CDS-191)—Silicone Products Dept., General Electric Co., Waterford, N. Y. Circle 402, Page 53

METAL SALVAGE — Steinlein & Kunze, Koblenze-Metternich, Germany. Circle 403, Page 53

FOUNDRY REFRACTORIES ("Refractories for the Foundry Industry")—A. P. Green Fire Brick Co., Mexico, Mo. Circle 404, Page 53

SELF-CURING BINDER — Thiem Products Inc., Milwaukee 19, Wis. Circle 405, Page 53

Ultrasonic Cleaning

Guide for potential users of ultrasonic cleaning equipment is designed to explain what ultrasonic cleaning is, how it works, areas in which it can be employed, and various solvents and detergents available for use with this equipment.—**National Ultrasonic Corp**, 111 Montgomery Ave., Irvington 11, N. J.

For More Details Circle No. 416—Page 53

Industrial Processing Ovens

Bulletin 159 describes and illustrates the company's complete line of industrial heat processing ovens.—**Hevi-Duty Electric Co.**, division of Basic Products Corp., 2040 W. Wisconsin Ave., Milwaukee 1, Wis.

For More Details Circle No. 417—Page 53

Overhead Material Handling

"Cost-Cutting with Monorail and Cranes" pictorially describes installation features and sequence of operation of company's overhead material handling equipment.—**Louden Machinery Co.**, subsidiary of Mechanical Handling Systems Inc., Fairfield, Iowa.

For More Details Circle No. 418—Page 53

Helical Gear Speed Reducers

Book 2751 presents tables of load classes and service factors for all helical gear speed reducers. Selected information on motor and geared flexible couplings also is contained in the booklet.—**Link-Belt Co.**, Dept. PR, Prudential Plaza, Chicago 1, Ill.

For More Details Circle No. 419—Page 53

Flexible Couplings

Twelve-page Bulletin A669C contains information on the company's line of flexible cushion couplings. Detailed tables of horsepower ratings, dimensions, and service factors for many applications are included.—**Dodge Mfg. Corp.**, Mishawaka, Ind.

For More Details Circle No. 420—Page 53

Vacuum Equipment

Four-page folder describes uses of company's equipment to reclaim, process, and convey materials. Range of standard models and typical applications are outlined.—**Invincible Vacuum Cleaner Mfg. Co.**, Dover, Ohio.

For More Details Circle No. 421—Page 53

Drives

Catalog M-592 explains in brief copy, photos, and drawings, the assortment of styles, modifications, and accessories of the line of Motodrives. The 96-page catalog includes construction features, speci-

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The **Original** SAFETY BACK WHEEL DEVELOPED IN 1956

MANHATTAN SAFETY BACK FLARED CUP

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SAFETY BACK far surpasses such safety features as anchor bushings, safety rings, special hub mountings, or ordinary revolving cup guards. With SAFETY BACK, steel covers the *entire* back of the flared cup . . . extends down the side to offer a degree of reinforcement and breakage resistance never before possible!

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Only SAFETY BACK gives you these features—*plus* Manhattan's custom-engineered abrasive bond for *faster* removal of *more* metal on your particular job—at no additional cost! For "More Use per Dollar" in portable grinding operations, you can't get a faster cutting, longer lasting—*safer* wheel than MANHATTAN.

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RM-559

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Circle 692 on Page 53

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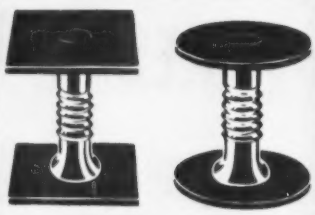
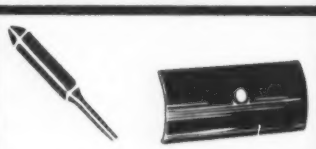
Cleveland Radiator Chaplets — include both popular open flat coil head and regular plate heads ... in all styles and finishes.

Motor Chaplets — made with annular fusion rings for uniform knitting and maximum core support; also with wide radius shoulders that eliminate gas-collecting voids under the heads.



Double-Head Chaplets — used for heavier metal sections, these chaplets are accurately made of low carbon steel and carefully tinned. Also produced in heavy and extra-heavy sizes.



Square Super Chills and Regular Curved Chills — accurately equalize cooling rates of thick and thin casting sections ... eliminate shrinks. Complete line ... black, copper or tin coating.

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Division of H. Hohlfelder Co.
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Circle 693 on Page 53

fications, speed and rating tables, and pricing information.—**Reeves Pulley Div., Reliance Electric & Engineering Co.**, Columbus, Ind.

For More Details Circle No. 422—Page 53

Barrel Finishing

Booklet A1525 describes in detail a seven-point system for scientifically controlled barrel finishing. The 36-page booklet entitled "CARBOtrol 7" lists a complete line of media, compounds, machines, and equipment.—**Carborundum Co.**, Advertising Branch, Niagara Falls, N. Y.

For More Details Circle No. 423—Page 53

Material Handling Equipment

Condensed Catalog 80-204 covers specifications for and illustrations of material handling equipment. An equipment selector chart gives quick visual reference to each type of equipment manufactured in every line.—**Lewis-Shepard Products Inc.**, Dept R9-26, 125 Walnut St., Watertown 72, Mass.

For More Details Circle No. 424—Page 53

Mechanical Dust Collectors

Drawings and application diagrams about an involute design improvement in mechanical dust collectors are contained in Bulletin 300, which also discusses a hopper discharge valve and large diameter tubes for the Cyclo-trell design.—**Research-Cottrell Inc.**, Bound Brook, N. J.

For More Details Circle No. 425—Page 53

Employee Incentive Plans

Address by D. R. Pohlman of Pohlman Foundry Inc., Buffalo, N. Y., suggests various types of employee incentive plans, their advantages, and disadvantages. A section on his company's experience is covered.—**Eddy-Rucker-Nickels Co.**, Harvard Square, Cambridge 38, Mass.

For More Details Circle No. 426—Page 53

Industrial Fans

Fundamental data relating to capacities and construction of the type I. E. line of industrial fans are presented in Bulletin L-5. Complete rating tables and dimensional diagrams are included.—**Lehigh Fan & Blower Div., Fuller Co.**, Catasauqua, Pa.

For More Details Circle No. 427—Page 53

Leasing Trucks

Various truck lease plans offered by the company are discussed in this 24-page booklet. It also contains a series of tables on calculating the cost of leasing a truck.—**Elwell-Parker Electric Co.**, 4205 St. Clair Ave., Cleveland 3, Ohio.

For More Details Circle No. 428—Page 53

Spray Guns

Condensed and simplified catalog sheet covers spray guns for die lubrication. Full specifications and accessories are listed.—**DeVilbiss Co.**, 300 Phillips Ave., Toledo 1, Ohio.

For More Details Circle No. 429—Page 53

Metal Surface Processing

Forty-page catalog illustrates and describes machinery and machinery systems for metal surface processing. Design features, components and accessories, and an index of the company's equipment for surface treatment of metals are included.—**Ransohoff Co.**, North Fifth Street at Ford Boulevard, Hamilton, Ohio.

For More Details Circle No. 430—Page 53

Belt-Joining

Brochure offers details of belt-joining and application of the company's Jackson Fasteners. Photographic instructions for the installation of the fasteners also are furnished.—**Imperial Belting Co.**, 1759 S. Kilbourn Ave., Chicago 23, Ill.

For More Details Circle No. 431—Page 53

Multi-Person Showers

Details of the basic shower column are given in this bulletin, with method of installation and floor plan suggestions.—**Bradley Washfountain Co.**, 2203 W. Michigan St., Milwaukee 1, Wis.

For More Details Circle No. 432—Page 53

Pneumatic Tools

Bulletin 102 describes the company's new Series 2 pneumatic tools, which are said to have larger, more powerful rotary vane motors.—**Doeden Tool Corp.**, Sherwood, Ohio.

For More Details Circle No. 433—Page 53

All-Weather Lubricants

Pamphlet lists 16 grades of all-weather, open-gear lubricant for outdoor equipment. Grade recommendations chart is included.—**Gredag Dept., Acheson Colloids Co.**, Port Huron, Mich.

For More Details Circle No. 434—Page 53

Wire Cutters

Catalog SM10 describes and illustrates core wire cutters, straighteners, electric riddles, and core draw equipment. Specifications charts are included.—**Beardsley & Piper Div., Pettibone Mulliken Corp.**, 2424 N. Cicero Ave., Chicago 39, Ill.

For More Details Circle No. 435—Page 53

Grouting Methods

Bulletin EPMA-2A details methods and techniques of good grouting. Diagrams, charts, and photos cover preparatory steps.—**Master Builders Co.**, 7016 Euclid Ave., Cleveland 3, Ohio.

For More Details Circle No. 436—Page 53

Metal Process Belts

Illustrated 34-page catalog contains data on metal process belts for high temperature and allied applications. Engineering charts, examples, and schematics are included.—**Ashworth Bros. Inc.**, P. O. Box 278, Winchester, Va.

For More Details Circle No. 437—Page 53

Industrial Weighing Systems

Four fact folders cover the basic art of weighing, accuracy in weighing systems, instrumentation used with modern weigh-

ing systems, and features of company's equipment.—A. H. Emery Co., Pine Street, New Canaan, Conn.

For More Details Circle No. 438—Page 53

Floor Trucks

Catalog 140 features manufacturer's line of floor trucks Symbolic truck numbering system and buyers' guide section are included.—**Hamilton Caster & Mfg. Co.**, 1704 Dixie Highway, Hamilton, Ohio.

For More Details Circle No. 439—Page 53

Chromium Alloys

"Chromium in Cast Iron" discusses the function of chromium in cast iron including an analysis of the various chromium alloys available to the iron foundry industry.—**Ohio Ferro-Alloys Corp.**, 839 30th St. N.W., Canton 9, Ohio.

For More Details Circle No. 440—Page 53

Conveyor Equipment

Catalog A-101 is 48 pages of illustrations and detailed diagrams of the company's equipment. Included are illustrations of effective combinations of pieces of equipment.—**Sage Equipment Co. Inc.**, 30 Essex St., Buffalo 13, N. Y.

For More Details Circle No. 441—Page 53

Cooling Hood

Bulletin offers tips on dealing with a hot sand problem. Specifications and operating details on cooling hood are provided.—**National Engineering Co.**, 600 Machinery Hall, 549 W. Washington St., Chicago 6, Ill.

For More Details Circle No. 442—Page 53

Spectrochemical Instruments

Brochure briefly describes the basic principles of operation and typical applications for the company's line of emission spectrochemical instruments.—**Baird-Atomic Inc.**, 33 University Rd., Cambridge 38, Mass.

For More Details Circle No. 443—Page 53

Crane Equipment

Crane equipment is covered in this 12-page catalog. Particular attention is given to custom-engineered overhead electric traveling crane bridges and electric trolley hoists.—**Conco Engineering Works**, Mendota, Ill

For More Details Circle No. 444—Page 53

Contact Wheels

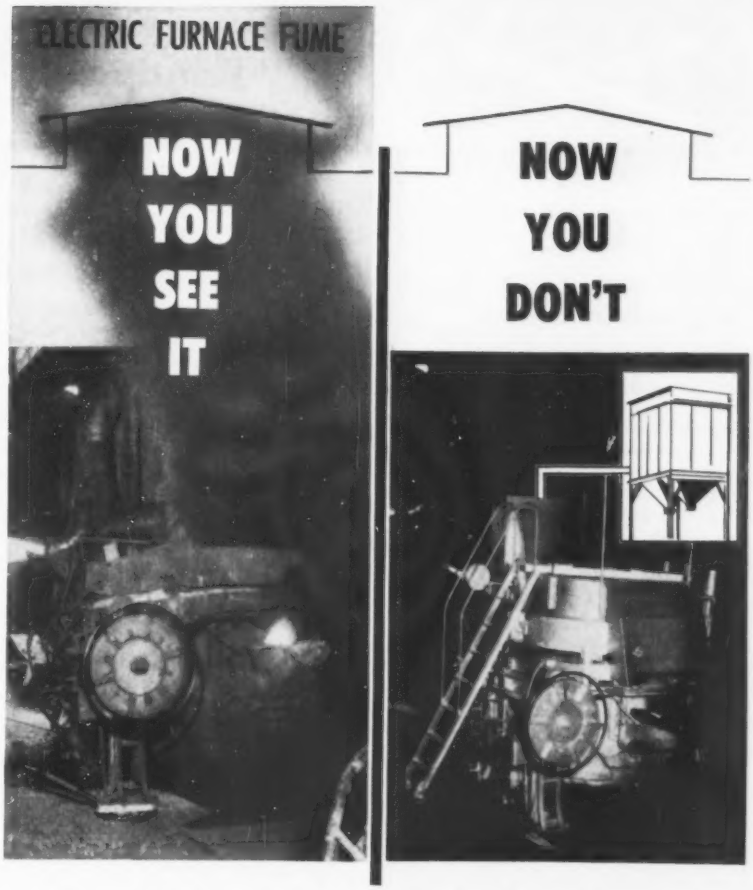
Technical data book describes selection, application, and operation of contact backup wheels for abrasive belt grinding and finishing. Catalog also contains section on industrial rollers.—**Chicago Rubber Co.**, Waukegan, Ill.

For More Details Circle No. 445—Page 53

Conveyors

Bulletin 69 illustrates and describes company's conveyor installations and pneumatic tube systems.—**Standard Conveyor Co.**, North St. Paul 9, Minn.

For More Details Circle No. 446—Page 53



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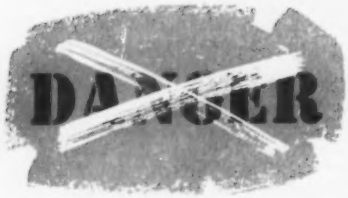

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Circle 696 on Page 53

The Sandman Says

By HAROLD E. HENDERSON
H. C. Macaulay Foundry Co.
Berkeley, Calif.

"California Iron Ore"

● WHEN Mark Twain wrote his famous story about the jumping frog, a California gold town called Angel's Camp attained a glory that seems destined to endure. At that time—1867—the Angel's Camp Iron Works had been producing castings for more than 13 years. Despite the changing of owners and names (today it is called California Electric Steel Co.), this foundry has enjoyed almost continuous operation for the last 105 years, an unusual record in a state which is only 109 years old.

D. C. Demarest is a historian of considerable note who recently celebrated his 93rd birthday. He was in charge of the foundry at Angel's Camp soon after the turn of the century, and he still retains stimulating memories of that period. Being a man of insatiable curiosity, he constantly sought new ways to advance his foundry practice. One of his recorded experiments, although only partially successful, is encouraging to those who dare to break with tradition.

In a letter to a friend, Demarest wrote, "Altaville, which adjoins Angel's Camp, has the distinction of being the place where the first successful reduction of California iron ore into metallic iron with use of California low-grade coal (lignite) was accomplished. Some months ago I promised that I would give you an account of an experiment that we once made at our Altaville Iron Works on electric smelting of California iron ores.

"In San Francisco about . . . 1920 . . . I became acquainted with R. A. Driscoll, an electric furnace operator, who during World War I had been in charge of six large electric furnaces at Anniston, Ala., that were producing ferromanganese for U. S. steelmaking plants. The operation there was being carried on under supervision of a noted French metallurgist named Humbert, who had been loaned by the French government to the United States for the duration of the war.

"During this operation, there came a time of shortage of coke supplies in this country. As coke was the medium required here for reduction of the manganese ores, these furnaces were threatened with a shutdown—a very serious matter. In the emergency, Driscoll had conceived the idea that he could keep the furnaces going with low-grade coal in place of coke. Since there was an abundance of such coal in Alabama, not far from this plant, Humbert gave his consent to the experiment that Driscoll proposed. A trial of the soft coal proved a success, so it was substitued for coke to the close of the operation.

"In my first talks with Driscoll, he expressed his belief that the method which he had discovered in Alabama could be applied successfully here to reduce our California iron ores with California low-grade coal or lignite. It was well known that there was no coking coal in California from which to make coke for the conventional method of smelting iron ores. So of course my interest was aroused, and I wanted

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to know the details of Driscoll's plan.

"He told me that he would use the Heroult type of electric furnace, but that he would build it with a top that would exclude the air from the furnace bowl. Coming through a packing gland in the furnace top and projecting into the upper part of the bowl, there would be a tube to serve two purposes.

"By means of a screw conveyor inside the tube, the charges of iron ore, lignite, and limestone (for flux) would be fed into the furnace bowl. And then, the gases that had been the volatiles in the lignite, having been freed by the furnace heat, would escape from the furnace through this same tube.

More Lignite Required

"Driscoll further said that the carbon content of the lignite would go to reduce the iron ore, while the ash content would be fluxed out of the furnace through the taphole as slag. He said that as the percentage of carbon in the lignite was low, it would require more lignite per ton of iron produced than of coking coal. . . . But then, there would be the advantage of not having to produce the carbon for reduction separately as coke.

"Driscoll said it was obvious that if the gases came out of the furnace unburned, they could be trapped and put through standard equipment in use at the coke ovens, to recover their commercial products, and so reduce the cost of production of the iron. The lignite gases would give up tar, benzine, ammonium sulfate (a fertilizer), and other products, all of which would be marketable here.

"As I couldn't see why Driscoll's plan shouldn't work out just as he envisioned it, and as I was deeply interested in the subject, I got a good friend of mine, Claude Bandy, to join me in building an experimental furnace to test the thing out. Before going at the job however, I sought opinions on the matter of two of the leading metallurgical engineers in California.

"The first one consulted was Will French, then manager of the open-hearth steel furnaces of Judson Mfg. Co. of Oakland. French had been Receiver of the defunct Noble Electric Furnace Co., which had attempted and failed to reduce Shasta

County iron ores with electricity; so he was conversant with electric furnace operation. Branch told me that Driscoll had put the proposition up to him, and that he had turned it down. He said, 'Driscoll has a pipe dream. Iron ores cannot be reduced to metallic iron with low-grade coal.'

"Then I called on John L. Key, who was the metallurgist in charge of the open-hearth steel furnaces of the Pacific Coast Steel Company at South San Francisco. Key said to me, 'Driscoll cannot do what he claims. There is only one way to reduce iron ores—that is, with the blast furnace, using coke or charcoal.'

Builds the Furnace

"My talks with these two metallurgical authorities hadn't altered my favorable opinions of Driscoll's process; so we started construction of our little furnace at our Altaville foundry. It was completed by our foundry foreman, A. E. Perkins, a most clever mechanic, working in conjunction with Driscoll.

"For the experiment, I had purchased some Shasta County iron ore from French, who kept a supply on hand at the Judson plant to 'purify' his furnace charges of scrap steel. When our transaction was concluded, French thought he had the laugh on me.

"Our foundry truck had brought in a quantity of limestone from surface croppings near Vallecite, about five miles away, and had hauled in a load of lignite pieces taken off the old coal mine dumps near Ione in Amador County. These looked like weathered bark from Oak trees. When Perkins notified us that all was ready, Bandy and I set out for Altaville, picking up our Stockton friend, Andrew McCormick, a retired, well-to-do business man who was interested in our test, and who with his friends was ready to go into the production of iron if it could be proved a profitable enterprise.

"Well, when the little furnace started up, after the first charge was in, a cloud of what looked like smoke poured out of the tube. Driscoll remarked, 'French would call that the smoke of the burned-out gases coming from the lignite. Now watch!'

"He touched a lighted match to

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the 'smoke cloud,' and instantly it became a long flame, proving conclusively that the cloud was green gas and not smoke. The furnace continued to be run until it had produced a number of pigs of iron, some of which had been broken to study the fracture. In addition, Perkins had poured some of the molten iron into sand molds to make small car wheels that were machined in our machine shop to show the density and other qualities of the castings.

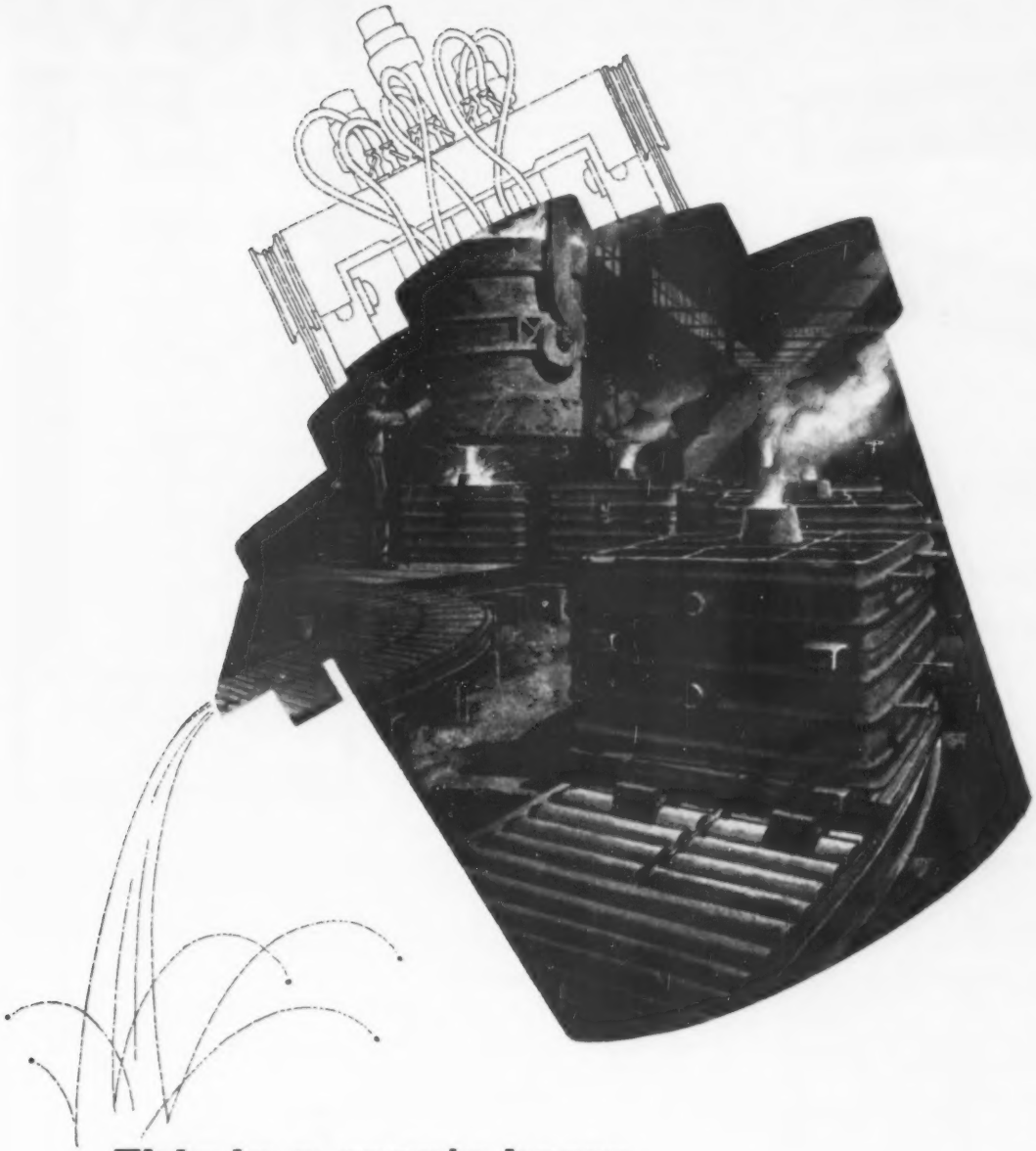
Cost Too High

"Our experiment had proved Driscoll's process to be a metallurgical success. When we returned to the Bay, I presented French with several pigs of iron made from his Shasta County iron ore. After making a careful examination of them, he said rather sheepishly, 'Well, you have proved that Driscoll can make commercial iron with lignite, but you have yet to prove that he can make it profitably.' I told French that we had accomplished what we had set out to do: That was to prove that iron ore can be reduced to metallic iron with electric furnace use of lignite.

"Before we left Altaville, we did some figuring on the cost of production of our iron. We measured consumption of material in the charges and of the electricity necessary to produce 100 lb of iron and came to the conclusion that the electricity cost, at the rates prevailing, was the factor that made it doubtful whether the process was then a commercial success. As we were unable to guarantee Mr. McCormick a safe investment, we dismissed the project that we had with him.

"Bandy and I believed that to get absolutely reliable cost figures for commercial purposes, we would require a production unit of a capacity of at least 10 tons of iron per day. As we had gone our limit in financing the little furnace, we decided to look for venture capital necessary for the larger experiment, believing that we had facts enough to put the thing over. However, we didn't succeed in our efforts, and our research came to an end.

"It may interest you to know that when Driscoll had finished with the demonstration of making iron, he manipulated the furnace charge and made pig steel, direct from the



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same iron ore and lignite. He told us that with addition of chrome and manganese ores, he could as well produce the alloy steels, chrome steel and manganese steel. We had every reason to believe that these alloy products can be made direct from the ores with lignite, and perhaps at a lower cost per ton than by the current methods.

"I would say that in our investigation of iron ore and lignite resources in this state, we located a considerable number of deposits of each material, scattered through southern, central, and northern California, including the iron ore occurrence that Kaiser is now using. From northern California we had a sample of lignite that looked like a chunk out of a tar barrel. It carried about 25 per cent carbon, was about 50 per cent volatile, and was free from sulfur—an ideal product for the Driscoll process. It was reported to us that within 12 miles of this lignite source, there was a mountain of iron ore.

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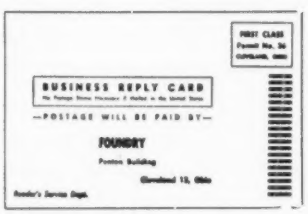

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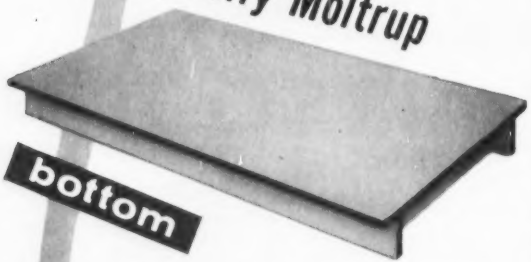

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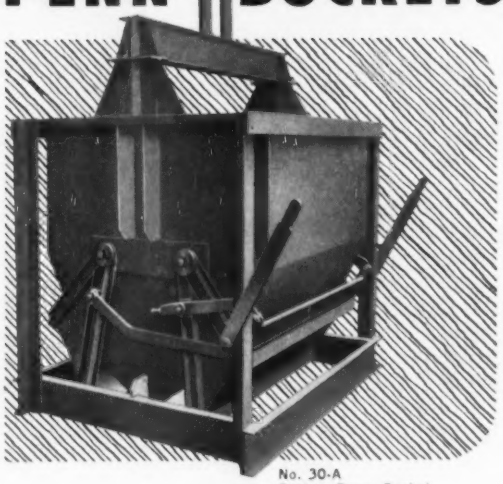

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Diamond Chemicals®

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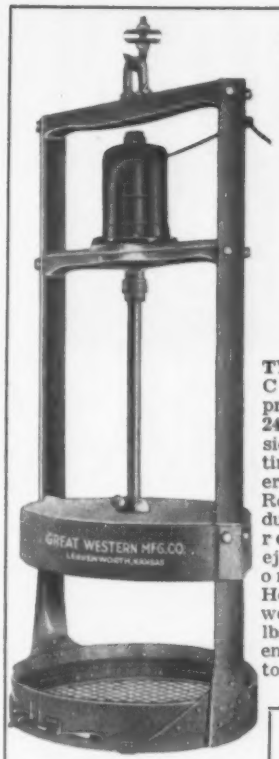
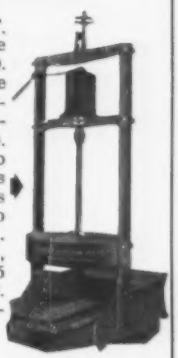


SCREEN TWICE AS MUCH FOR HALF YOUR PRESENT COST!

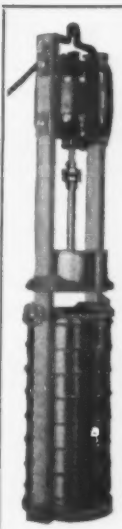
COMBS GYRATORY RIDDLES

"Greatest Name in Motion"



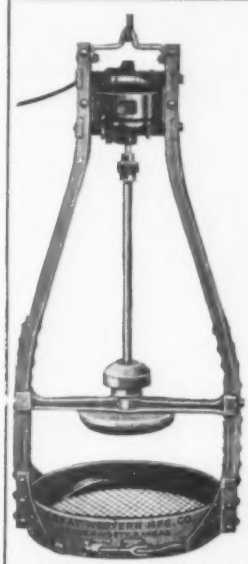
TYPE "CS". Complete price $395.00. 24" square sieve. A continuous operation sieve. Requires no dumping, as refuse is ejected off to one side. Height 4'10", weight 295 lbs, ½ H.P. enclosed motor.

TYPE "CR". Complete price $385.00. 24" dia. round sieve. Sifts, fluffs, mixes, aerates sand. Height 4'6", weight 250 lbs., 1/3 H.P. enclosed motor.



TYPE "HL". Price $285.00 complete, less sieves. Laboratory model especially designed for laboratory sand control, fitted with 1/6 H.P. enclosed motor.

PROMPT DELIVERY from your Foundry Supply House



TYPE "V". Price, 20" Sieve, $300.00. Does the work of 10 men. Screens sand, Fine, Medium, and Coarse. 20" dia. sieve with special clamp for 5-second changes. Height 4'6", weight 100 lbs., fully-enclosed 1/6 H.P. motor. Also available in Giant V-5 with 36" sieve for triple capacity . . . Price $545.00.

MAIL THE COUPON NOW!

GREAT WESTERN MFG. CO.

Leavenworth, Kansas **Phone MU-22291**

☐ Send Additional FREE Information

NAME

ADDRESS

CITY STATE

Circle 712 on Page 53

GLUTRIN
LIQUID BINDER

GOULAC
DRY BINDER

For

CORE WORK, SAND FACINGS, SPRAYS

Write for pamphlets giving detailed information. Both materials carried in stock by America's foremost foundry jobbers

ROBESON PROCESS COMPANY

(Established 1905)

GENERAL OFFICES AND PLANT: • ERIE, PA.

Circle 713 on Page 53

HARTLEY Controls CORPORATION • NEENAH • WISCONSIN

Originators of Fully Automated Sand Systems for Foundries

Full details will be sent promptly on complete systems • Sand Controls •
Moisture Controls • Mixer Timers • Bond Feeders • Bin Controls • Mixer Selectors • Pneumatic Transporters

Circle 714 on Page 53

Order From Your Foundry Supply House

TEX-VENT

Flexible TEXTILE Core Vent

New venting material for sand cores. Disintegrates completely if core is baked . . . leaves no residue. Allows unrestricted use of cold-setting processes.

DOMESTIC Industries, Inc.
470 W. Broad St. Columbus, O.

Circle 715 on Page 53

THE METALLURGY OF STEEL CASTINGS

By Charles W. Briggs

625 pages, 334 illus. Price $11.00 Postpaid

A comprehensive work giving detailed data on the chemistry, metallurgy and technology of steel castings. Provides complete information on methods of technical and industrial control in production of steel castings and describes every manufacturing process used.

FOUNDRY Book Department
1213 W. 3rd St. Cleveland 13, Ohio

Circle 717 on Page 53

COMPARE YOUR PRESENT COSTS with RINGLIFT SAND CONDITIONING!

The Ringlift Conditioner does a far more thorough sand conditioning job in less time at lowest cost per ton. Picks up, screens, cools, aerates, tempers, molding sand. Removes scrap magnetically. Adds moisture. Deposits sand in neat windrows on floor. Compare it for performance and see why many foundries prefer the Ringlift. Send for literature.

STATES ENGINEERING CORPORATION
245 E. Murray St.,
Fort Wayne, Indiana.

SAND PREPARATION • MECHANIZATION • PLANT LAYOUT

Circle 716 on Page 53

IMPORTANT NEW SHAPE IN WHEEL DRESSING

Johnston Huntington

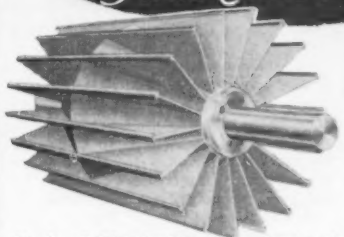
- Safe, comfortable Handle
- 6 Sets of Bearings
- Extra High Carbon Milled Cutter Teeth

Ask your distributor, or write direct for "Dresser Guide" and prices . . .

MACHINE PRODUCTS CORP.
127 Hollier Ave. Dayton 3, Ohio

Circle 718 on Page 53

STOP! MISALIGNMENT USE VAN GORP *Turn-Clean* PULLEYS



DODGE TAPER-LOCK SIZES 8" to 60"

Van Gorp Self-Cleaning Pulleys are designed to stop costly, troublesome problems. Individual wing construction insures automatic positive cleaning action because rotation of the pulley discharges all foreign material to the sides of the pulley. No more abrasive belt wear! Conveyor belts are always properly aligned!

Rugged, all welded steel construction makes Van Gorp Pulleys durable and capable of top performance even under the most severe working conditions. BIG PULLEYS — up to 5 feet in diameter and 5½ feet in face width and a 10-inch maximum bore. Be wise, specify Van Gorp Self-Cleaning Pulleys. Write for FREE Catalog.

Van Gorp Mfg. Inc.
PELLA, IOWA

Circle 719 on Page 53

3 WAYS YOU SAVE TIME with this New, Low-Cost AIR REEL

NEW, low-cost GRACO Air Hose Reel has three-way utility to save time and effort in using air-powered hand tools! Runs free . . . stops at 9 in. intervals . . . or adjusts to balance the tool. Only 12 in. high, 10 in. deep, 5 in. wide . . . it's a money-saving midget! Bolts to wall, post or ceiling . . . includes 15 ft., ¼ in. ID air hose. Gives you more *working* freedom . . . *investigate today!*

RUNS FREE! Allows free-wheeling work within 15 ft. radius. Spring pick-up gives effortless hose retraction.

STOPS! Simple touch of a lever activates ratchet to provide automatic latch stops every 9 ins. . . . 19 stops in all.

BALANCES! Spring tension on hose pickup easily adjusts to counter-balance weight of the tool. Saves muscle power!

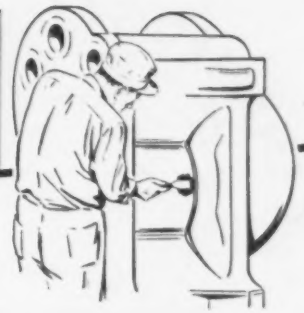
See your local supplier or write today for details!

GRACO ENGINEERS AND MANUFACTURERS

GRAY COMPANY, INC. • 1125 Graco Square • Minneapolis 13, Minn.

(See Phone Book Yellow Pages, Spraying, for Local Graco Suppliers)

Circle 720 on Page 53



These features mean BETTER LOOKING CASTINGS

TIGHT, LASTING REPAIRS

When correcting blow or sand holes, surface blemishes, or rough and porous areas in castings, you can depend on Smooth-On Foundry Cements, standard of the industry for more than 63 years. They are easy to apply, harden quickly, stay firmly in place.

THREE DIFFERENT SHADES

With 3 different shades to pick from, you know you can get a close match for your castings.

4AA—Light gray, fine texture
4A —Medium gray, medium texture
4B —Dark gray, coarser texture

UNIFORM QUALITY

Rigid quality control means you can be sure that the strength and color of Smooth-On Foundry Cements will not vary from one order to the next. Every lot of Smooth-On cements is laboratory tested and must satisfy tests for setting time, hardness, and color before it is packed for shipment.

FREE SAMPLES

Why not try one or more of these Foundry Cements at our expense? We will be glad to send you a free sample of any of the cements described above if you will write us on your business letterhead. Write today, and see how Smooth-On can improve the appearance of your castings.

SMOOTH-ON MANUFACTURING CO.
570 Communipaw Ave., Jersey City 4, N. J.

SMOOTH-ON FOUNDRY CEMENTS

SO-269

Circle 721 on Page 53

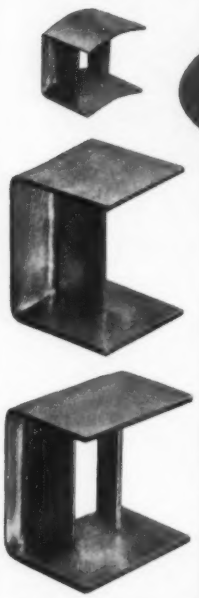
CENTRIFUGAL CASTING · INCREASES PRODUCTION

You can save as much as 25% in labor costs while increasing your production as much as 35% by making castings centrifugally. Highest quality castings, a minimum of rejects, and use of unskilled labor contribute to more profitable operation. It will pay you to ask for complete information.

CENTRIFUGAL CASTING MACHINE COMPANY
P. O. BOX 947 TULSA 1, OKLAHOMA

Circle 722 on Page 53

WHY POUR YOUR PROFITS AWAY?
save up to 50% on chaplets



Buffalo ECONOMY CHAPLETS

Now you can save up to 50% on chaplet costs with Buffalo Patented Angle Stem and Double Angle Chaplets. They burn in more easily, without chilling. They are thoroughly coated to assure instant fusion with molten metal. And the unusual strength of the one-piece design permits fabrication in thinner gauges. All these features mean *savings to you.*

Furnished in a complete line of sizes and gauges, Buffalo Economy Chaplets are available in tinned steel, Monel, stainless steel and copper. Why not give them a trial? It costs only pennies to find out how many dollars you will save.

Write for literature on Economy Chaplets. For information on the complete "Buffalo" line, request Catalog No. 20.

MANUFACTURED BY
Combined SUPPLY & EQUIPMENT CO., INC.
211 Chandler St., Buffalo 7, N. Y.

Circle 724 on Page 53

FOUNDRY
EDWIN S. CARMAN, INC.
LEE ROAD AT MAYFIELD
CLEVELAND 18, OHIO
A COMPLETE FOUNDRY SERVICE
MODERNIZATION

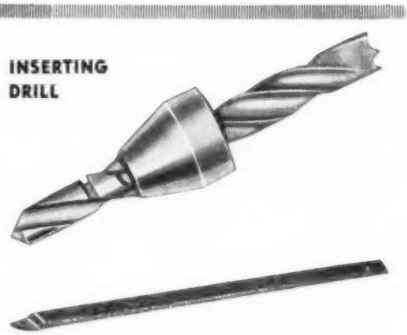
Circle 723 on Page 53

EMPIRE*
"THAT GOOD"
FOUNDRY COKE
DEBARDELEBEN COAL CORPORATION
2201 First Ave., North • Birmingham 3, Ala.
Phone: ALpine 1-9135
*Reg. U.S. Pat. Off.

Circle 725 on Page 53

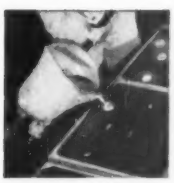
Slotted core box vents for every purpose. Inserting drill (right) ideal for inserting core vents. Special cleaning tool saves time.

C. M. SMILLIE & COMPANY
1124 WOODWARD HGTS.
FERNDALE 20, MICH.



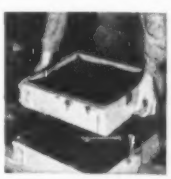
How to improve your aluminum, magnesium castings with B&A® Alkali Fluoborates

and Potassium Titanium Fluoride



In aluminum casting, use B&A Potassium Fluoborate as a purifying flux for removal of oxides. It is an excellent degassing agent, forms a dry dross, and improves fluidity of the molten metal.

Subsequent treatment with Potassium Titanium Fluoride, or a mixture of Potassium Titanium Fluoride with Potassium Fluoborate (for lower melting temperatures), produces a better grain structure in the metal. Improved grain refinement gives increased tensile strength, greater elongation, better machinability, etc.



In magnesium casting, use the B&A Alkali Fluoborates as oxidation inhibitors with both green sand and core sand. They help reduce rejects . . . cores are easier to make, faster to collapse, easier to shake out.

For further information, write or call your nearest B&A office. Ask for technical data on the use of B&A Ammonium Fluoborate, Potassium Fluoborate and Sodium Fluoborate in the light metals industry.

BAKER & ADAMSON® Fine Chemicals

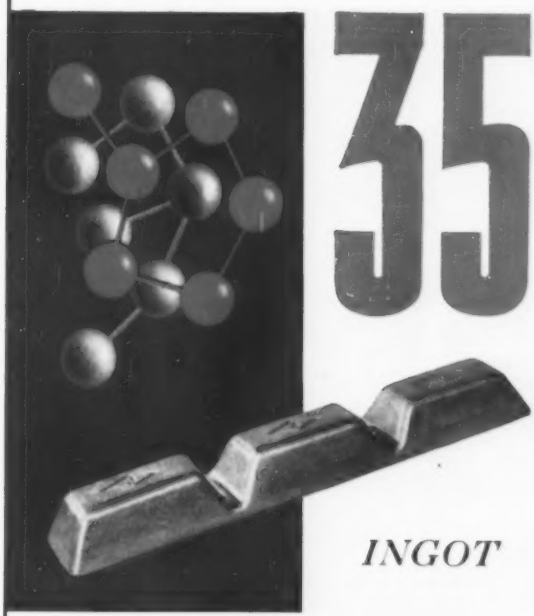
Allied Chemical

GENERAL CHEMICAL DIVISION
40 Rector Street, New York 6, N. Y.

Offices: Albany • Atlanta • Baltimore • Birmingham • Boston • Bridgeport Buffalo • Charlotte • Chicago • Cleveland (Miss.) • Cleveland (Ohio) • Denver Detroit • Houston • Jacksonville • Kalamazoo • Los Angeles • Milwaukee Minneapolis • New York • Philadelphia • Pittsburgh • Portland (Ore.) Providence • San Francisco • St. Louis • Seattle • Kennewick, Vancouver and Yakima (Wash.)

Circle 727 on Page 53

ALMAG 35



INGOT

UTMOST DIMENSIONAL STABILITY*

Almag 35 is a high purity aluminum-magnesium alloy possessing exceptional dimensional stability properties, which fully assure the finest castings with all the following advantages:

- High strength
- High shock resistance
- High corrosion resistance
- High ductility
- No age hardening
- Superior machineability
- Takes high polish
- As cast without heat treatment no locked up stresses

Covered by U.S. Patents 2564044, 2568179, 2628899, 2704482, 2568180, 2584772, 2733991 and 2583473. Do not accept substitutes.

ASK FOR BULLETIN No. 354

WILLIAM F. JOBBINS INCORPORATED

J

P. O. BOX 230
AURORA • ILLINOIS

*Stabilization at 700°F provides absolute stress relief without loss of properties or machineability.

Circle 728 on Page 53

CLASSIFIED ADVERTISING

• HELP WANTED

GENERAL MANAGER
(FOUNDRY)

A Manager is sought for our Wisconsin foundry producing small to medium size gray iron job castings. Will have charge of sales, production, engineering, and maintenance, and direct several hundred people. Background must be in ferrous foundry. It could be in general management, or in sales, finance, or manufacturing at a top level of responsibility. A strong, proven administrative record is uppermost. Must know foundry operations and problems, but not be a technologist alone. Excellent potential to Executive V.P. Age 40-50, engineering degree desired. Appropriate compensation arrangements. We invite your resume in confidence.

BOX 752, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

HIGH ALLOY CASTINGS—SALES ENGINEER

Challenging opportunity to develop sales of new division producing heat and corrosion resistant castings for well established steel foundry.

Engineering degree, sales experience, and metal industry or foundry background required.

Fine living and recreational advantages.

Send complete resume, including salary requirements, and photo if possible, to:

W. E. NIEMACKL
MINNEAPOLIS ELECTRIC STEEL CASTINGS CO.
3800 N.E. 5th St.
MINNEAPOLIS, MINN.

FOUNDRY SUPERINTENDENT

Should have experience in achieving modern production standards with up to date mechanized foundry equipment.

This man will be responsible for all melting and molding operations in doing jobbing work on a production basis. Position entails supervision of foremen and production personnel with no responsibility for core or cleaning departments.

A good opportunity with a well established company in Central New York.

OBERDORFER FOUNDRIES, INC.
SYRACUSE, NEW YORK
Attention: Personnel Director

FOUNDRY ENGINEER

With Executive Ability, experienced on layout of all types of foundry equipment, material handling and material flows. Send complete details on work history, education. Age 32-48.

BOX 740, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

CHIEF INSPECTOR

Aggressive man needed to take charge of gray iron inspection department. This is a jobbing shop with good opportunity.

CENTURY FOUNDRY
3711 MARKET ST.
ST. LOUIS 10, MO.

METALLURGIST

B.S. or M.S. in metallurgy or equivalent. Experience in carbon, low alloy and high alloy steels desirable. Opportunity for challenging work on forged, rolled and cast products in central research laboratory of Nation's largest steel castings producer. Age to 35. Send resume of qualifications to: John A. Rassenfos, Manager, Manufacturing Research Laboratory, American Steel Foundries, East Chicago, Indiana.

SUPERINTENDENT

For mechanized malleable iron foundry. All replies should contain complete resume. Our personnel know of this advertisement. Address: Box 745, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT

Malleable foundry in the East, making small to medium sized castings needs man thoroughly versed in all phases of jobbing production and capable of directing melting, molding, coremaking, laboratory, annealing and maintenance operations. Must have thorough knowledge of layouts, gating and pouring. Excellent opportunity for qualified man in a progressive organization.

Send complete details, experience, salary requirements, date available and a recent photograph in first letter. All replies confidential.

BOX 800 FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

SALES ENGINEER

Gray iron and ductile iron castings in the Detroit and southern Michigan area for large progressive Mid-west jobbing foundry. Experience in ferrous foundry necessary. Car furnished. Submit personal data and salary requirements.

BOX 760, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRYMAN

Experienced man to take complete charge of making large specialty aluminum castings. No. production work. Soundness of castings of prime importance. Ideal position for competent man who does not want headaches of large foundry. Only qualified man with successful record need apply. Submit resume to:

SPRINGFIELD CAST PRODUCTS, INC.
124 SWITZER AVENUE
SPRINGFIELD, MASS.

METALLURGIST OR METALLURGICAL ENGINEER

For work in gray cast iron. B.S. Degree and some melting experience desirable. Duties would involve service and development work on alloys in iron. Moderate travel.

BOX 779, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

GREEN SAND FOREMAN

Qualified and progressive foreman desired in jobbing green sand department manufacturing light and medium sized castings. Must know mounting of jobs for squeezer molding and be able to handle men. Well established iron foundry in northern Ohio. Address: Box 783, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SALESMAN

Large gray iron foundry in New England needs foundry salesman for New Jersey and Pennsylvania area. Must have sales and gray iron foundry experience. Salary open. Address: Box 758, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• HELP WANTED

OPENINGS FOR QUALIFIED PERSONNEL

Large progressive gray iron foundry producing automotive castings located in Central Indiana, has openings for personnel qualified in the following positions:

Superintendent
Metallurgist
General Foreman
Foreman
Permanent Mold Supervisor

Send complete format including desired salary. All replies confidential.

Box 781, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

PLANT ENGINEERS

Experienced on layout of all types of foundry equipment, material handling and material flows. Send complete details on work history, education and family status. Include recent photograph. All replies confidential.

BOX 786, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

GENERAL CLEANING ROOM FOREMAN

Desire man 30-40 years of age with necessary drive and skill to organize department. Must have knowledge of the various cleaning room processes including welding, heat treating, arcair and materials handling methods. Reply giving age, resume of experience, personal background and salary requirements. All replies held in confidence:

WORKS MANAGER
MINNEAPOLIS ELECTRIC STEEL CASTINGS COMPANY
3800 N. E. FIFTH STREET
MINNEAPOLIS 21, MINNESOTA

MOLD FOREMAN

Experience required in gray iron jobbing shop. Squeezer and roll over work. Relocated middlewest.

BOX 738, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

METALLURGIST

Recent college graduate to supervise laboratory for gray iron and ductile production, cupola and electric furnace melting facilities. Send resume:

CENTURY FOUNDRY
3711 MARKET ST.
ST. LOUIS 10, MO.

METALLURGIST SUPERVISOR

Small plant in Ohio seeking college graduate, with experience in nonferrous, small casting foundry operations. Desire person with supervisory experience to handle complete foundry operations. Please send resume of education, experience and salary requirement. Address: Box 765, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WANTED

Research and technical Director for gray iron foundry southeast Wisconsin. Must be college graduate under 40 years and experienced, and a desire to remain in the foundry industry. Excellent opportunity. Address: Box 790, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• HELP WANTED

GRADUATE ENGINEER

35-45. Must be capable of supervising establishment of Process Engineering Department in gray iron foundry, including methods, rigging, standards for estimating, scheduling, budget and cost control. Professional experience desirable but not necesesary. Give complete experience and compensation requirements with photo.

BOX 787, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

KEY EXECUTIVE

Diversified foundry operations. Wide background in sales and knowledge of steel and iron foundry operations. Excellent opportunity for aggressive, able administrator. Write giving full resume.

BOX 755, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY SUPERINTENDENT

Have you practical experience and technical knowledge and ability to be a key man in this nonferrous foundry in western New York? Unusual technical equipment—specialized in high strength aluminums and bronzes—small and aggressive—a special situation for the right man.

BOX 774, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

COMPTROLLER

35-45. Must have substantial background in foundry cost control and budgets. Professional experience desirable but not necessary. Send complete record and compensation requirements including recent photo.

BOX 785, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

RESEARCH ENGINEER

Excellent opportunity in progressive foundry for right man, supervising sand and quality control. Mechanized foundry making gray iron, ductile iron and ni-resist. Located in central Indiana. Position offers opportunity for advancement. Age 25 to 35 years. Telephone Westfield, Indiana, 3-3285 between 7:00-9:00 P.M.

BOX 739, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

METALLURGIST

B.S. degree Metallurgical Engineering required. Must have had several years experience in gray iron foundry, and be thoroughly versed in cupola operation and qualified to head Melting Department in a large mechanized foundry. Midwest location. Submit complete resume on education and experience, also salary requirements. All replies held in confidence.

BOX 784, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

PLANT SUPERINTENDENT

Small plant in Ohio seeking Superintendent of operations and maintenance involving nonferrous castings, machining, finishing, and assembly operations. Desire person with metallurgical and foundry background in nonferrous castings. Please send complete resume of education, experience, and salary requirements. Address: Box 764, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

METALLURGIST

EAST COAST FOUNDRY PRODUCING IRON AND STEEL HAS OPPORTUNITY FOR GRADUATE METALLURGIST. ELECTRIC FURNACE EXPERIENCE WOULD BE DESIRABLE. PREVIOUS WORK IN GATING AND SAND CONTROL HELPFUL. SUBMIT RESUME AND SALARY REQUIREMENTS IN FIRST REPLY. ADDRESS: BOX 750, FOUNDRY, PENTON BLDG., CLEVELAND 13, OHIO.

METALLURGIST—SAND SPECIALIST

Unusual opportunity for man thoroughly familiar with latest developments in sand and metallurgical practices for automotive and farm implement gray and malleable iron castings. This is an overseas assignment. Send complete information, in confidence, on education, work history including earnings record and personal data. Include small, recent photograph. Address: Box 788, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• HELP WANTED

ENGINEER

Familiar with standards, work simplification, foundry equipment maintenance, etc. All replies should contain complete resume. Our personnel know of this advertisement. Address: Box 746, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• POSITIONS WANTED

FOUNDRYMAN

With managerial experience in iron, steel, high alloys, malleable, would like position as troubleshooter, layout, gating, rigging for production or jobbing, passing to others my abilities gained in over 40 years practical experience. Customer contact and personnel relationships. Will work for large or small organization. Western states preferred, free to travel. Address: Box 751, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

COREROOM SUPERVISOR

20 years coreroom supervision, thorough knowledge of all phases of coreroom, in steel and iron, on jobbing and mechanized, blowers, rollover, bench and CO_2. Good labor relations, any location. Address: Box 777, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT

Practical and technical 30 years' experience jobbing and production. Familiar with every phase of the foundry. Now employed. Address: Box 795, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN

Metallurgist, experienced in all phases of iron, ductile and nonferrous jobbing work from shop to top management level, desires to locate in Rocky Mountain area in sales or operations job with real challenge. Age 30. Address: Box 749, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER

Progressive foundryman familiar with every phase of practical experience on all classes of work. Now employed. Would like to make change. Address: Box 791, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT—MANAGER

Practical, progressive and technical foundryman. 28 years in ferrous and nonferrous jobbing and production work. 20 years experience as superintendent and manager. Well versed in all phases of the foundry. Good trouble shooter. Best of references. Age 47, now employed. Address: Box 778, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY EXECUTIVE

Twenty-five years as superintendent and manager. Experienced in all phases of foundry management, as well as centrifugal casting, stack molding, and both direct arc and induction furnace melting. Address: Box 773, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

INVESTMENT CASTING

Engineer with 14 years experience in plant management, estimating, tool design, job engineering, production and quality control. Available full-time or as consultant to set up new plant or move into existing plant, ferrous or nonferrous. Resume on request. Address: Box 776 FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY EXECUTIVE

Progressive foundry man with 16 years experience as foundry Superintendent, finishing Superintendent, and Industrial Engineer in both malleable and steel would like to make change. Consider sales, operating or consulting. Prefer small organization. Address: Box 762, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

METALLURGIST

Young metallurgist with two years experience in gray iron foundry operations desires connection with progressive iron or steel foundry. Experience in metallurgical control and as production foreman. Willing to learn, will relocate. Address: Box 799, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT or MANAGER

Practical and technical foundryman with broad experience in conventional or highly mechanized foundries. Graduate in mixing and melting of iron, cupola practice and metallurgy. Excellent sand control. Address: Box 798, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GRAY IRON FOUNDRYMAN

Broad 20 years experience, including basic cupola ductile, metal, casting and sand control, age 48, will relocate. Available. Address: Box 796, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• POSITIONS WANTED

FOREMAN

Young foreman with background in steel and iron desires position in core room or molding department. Four years apprenticeship and journeyman previous to supervisory work. Willing to relocate. Address: Box 793, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER

Practical foundryman nationally known for a job well done. Age 47. Good health. Now employed. Looking for more action ferrous or nonferrous. $15,000 minimum. Address: Box 767, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PATTERN SHOP SUPERVISOR

Wants position in foundry or pattern shop. 25 years experience in planning, supervising and engineering in wood, metal and plastic. Presently employed as supervisor, wish to relocate. Address: Box 744, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

STEEL FOUNDRY ENGINEER

Wants executive position of responsibility. Graduate engineer with 10 years experience in all phases of steel foundry operations. Presently employed. Address: Box 759, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT—OPERATIONS

Age 42, full experience all phases malleable and gray iron, mechanized and static production. Desire reassociation, will consider service field. No restrictions as to relocation or travel. Address: Box 747, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT

Practical gray iron foundryman technically trained, thirty years broad experience light/heavy castings. General jobbing production mechanization. Well versed in costs, modern sand metal and scrap control. Desires connection with sound reliable firm demanding results. Age 55. Address: Box 792, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY EXECUTIVE

Fully experienced in the manufacture of high silicon iron and high alloy steel castings. Staff work preferred. Can be helpful in casting design, patterns and rigging, molding, coremaking, melting. Fully understand importance of manufacturing cost. Age 55. Address: Box 797, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN

Practical jobbing and pattern plate molder—I.C.S. Foundrymen's Diploma, desires permanent connection with well established foundry. Preferably Florida or Texas. Reply: Molder, 2507 30th Ave. No., Birmingham, Alabama.

SUPERINTENDENT-ENGINEER SALES

Young, nonferrous, foundry Superintendent, now employed, desires change. Experienced in foundry supervision, both top production and jobb'ng foundries, for 16 years. Best of references. Address: Box 763, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

COREROOM SUPERINTENDENT

Or General Coreroom Foreman. 19 years experience in gray iron foundry. Age 41. Married with family. Jobbing or production, bench or floor work. Qualified to take complete charge of all coreroom operations. Willing to relocate. Address: Box 771, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY EXECUTIVE

Age 36, 17 years experience in practical foundry and sales management with all types of steel castings. Casting design, heading and gating, pattern equipment, industrial relations and selling; highest aptitudes. Address: Box 761, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT

Progressive foundryman experienced in all phases of steel foundry production, expert gate and head man. Presently employed. Address: Box 780, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• REPRESENTATIVES WANTED

SALES REPRESENTATIVE

Foundry supply company

Foundry supply company and flux manufacturer requires services of sales representative to call on accounts in part of Illinois, Iowa, eventually Minnesota. There is also part of Pennsylvania and other Eastern States open. Address: Box 757, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• REPRESENTATIVES WANTED

SALES REPRESENTATIVES

Here is an established competitively-priced line you can count on for a good income. Milward Alloys, a leading manufacturer with a strong reputation is now in the process of localizing many sales areas to give better service to customers and prospects from coast to coast. A considerable number of territories are open. We need men who will take them on, full or part time.

You may now be serving the trade or you may have foundry experience. Maybe you're retired with time on your hands. Regardless of your situation, you will be amply rewarded—because Milward's line is broad and in constant demand. Milward alloys cut foundry costs. Orders are promptly filled. That's why we have a substantial reorder business.

The Milward line includes: copper shot; phosphor copper and other powerful deoxidizers and degasifiers; aluminum bronze and manganese bronze hardeners and ingots; copper silicon, copper manganese, copper iron, copper aluminum and copper chrome alloys; nickel copper and nickel iron alloys; aluminum titanium, aluminum silicon, aluminum manganese, aluminum iron and aluminum copper and other alloys.

Phone or send us a letter describing the area or locality you can cover, whether full or part time, and tell us a little about yourself . . . your qualifications, experience, and when available. This may well be the connection you've been waiting for. Write or phone: Mr. David B. Milward, President. Phones: Lockport, N. Y. 4-0435, or Buffalo, N. Y. LUdlow 6425.

MILWARD ALLOYS, INC.
Lockport, N. Y.

MANUFACTURER'S REPRESENTATIVES

Well known aluminum permanent mold foundry requires services of manufacturers representatives to call on industrial accounts in Wisconsin, Michigan, Illinois, Indiana, Minnesota and Iowa. Prefer man with related foundry lines.

BOX 748, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

SALES REPRESENTATIVES

Large group of diversified heavy steel and iron foundries. Excellent opportunity to be associated with aggressive well established corporation. Write giving full details.

BOX 756, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

SALES REPRESENTATIVES

Leading manufacturer of industrial ovens and furnaces needs representation in these areas: Texas, Missouri, Illinois, Minnesota, New York. Address: Box 772, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANUFACTURER'S AGENT

Wanted to represent malleable foundry in western Pennsylvania. Address: Box 743, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• REPRESENTATIVES AVAILABLE

FOUNDRY SALES REPRESENTATION

Aggressive young man, 30, five years foundry sales experience, (grinding wheels) has opportunity to diversify. Would like to handle two or three additional foundry items, giving specific product concentration. Presently covering southeast from Birmingham. Best references. Address: Box 775 FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES REPRESENTATIVE

Experienced foundry supply and equipment sales representative desires Michigan territory. Fifteen years technical and practical background in steel and iron foundry supervision. Address: Box 794, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• EMPLOYMENT SERVICE

FOUNDRY PERSONNEL SPECIALISTS

National Placement and Procurement of
GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS

Confidential Inquiries Invited
From Employers and Qualified Applicants

For Fast Competent Assistance Contact
DRAKE PERSONNEL, INC. FINANCIAL 6-8700
JOHN COPE, DIRECTOR, 29 E. MADISON ST., CHICAGO 2, ILL.

• ENGINEERING SERVICE

SPECIAL SERVICE . . .

You may have a PROBLEM which you have been UNABLE TO RESOLVE with your own organization personnel. A problem that could be QUICKLY SOLVED in a month . . . a week . . . a day . . . BY A WELL-QUALIFIED MAN of experience. We have a man or men with many years of experience in the exact areas with which you are concerned. Representative areas include plant layout, modernization, operation, selection and installation of equipment, technical processes, metallurgy, personnel development, methods, etc. To help you, we assign individuals who have 40 or more years of actual experience in specialized fields . . . invaluable know-how, yours to command for as long as you need it. WRITE OR PHONE for detailed information.
WESTOVER SPECIAL SERVICE ASSOCIATES
3110 W. Fond du Lac Ave., Milwaukee 10, Wisconsin, Phone Custer 3-2121

Designed and Gated
MAGNESIUM PERMANENT MOLDS

Address inquiry to:

BOX 766, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

• FOUNDRY CONSULTANTS

LET US GUIDE YOUR PLANT LOCATION OR RELOCATION

We suggest, recommend, and consult with you offering all information necessary including solicitation of subsidies you may require. All information held in complete confidence. Wire, phone, or write:

MARKETIZING OF AMERICA, INC.
150 EAST BROAD STREET
COLUMBUS 15, OHIO
Telephone CApital 1-2375

FOUNDRY CONSULTANT-NONFERROUS

Sand casting—permanent mold casting—centrifugal castings — in aluminum — brasses — bronzes —30% leaded bronze—aircraft quality bearings and castings. Address: ED JENKINS, 286 PENOBSCOTT BLDG., DETROIT 26, MICHIGAN. PHONE: WOODWARD 5-7947.

• WANTED-TO-BUY

WANTED TO BUY

All grades of SCRAP ALUMINUM Truckloads or carloads including: Drosses, spills, risers, etc.

Submit offering in writing to:

SONKEN-GALAMBA CORP.
KANSAS CITY 18, KANSAS

WANTED

Osborn 275JW straddle type squeezers. Address: Box 782, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• WANTED-TO-BUY

IF YOU OPERATE
A FURNACE

We will purchase your scrap linings, retorts, conveyors, muffles, racks, etc. Any item made of nickel alloy. Write, Wire or Call:

WEINSTEIN COMPANY
610 W. 8th STREET
JAMESTOWN, NEW YORK
PHONE: 61-154

MATERIAL WANTED

Scrap Carbon or Graphite. Will buy by car. Reply:

CENTURY FOUNDRY
3711 MARKET ST.
ST. LOUIS 10, MO.

WANTED

Used or Broken Silicon Carbide Grinding Wheels of any kind or size, regardless of bond. Will pay $35.00 per ton. Union Mining Co., 1st Nat'l. Bank Bldg., Pittsburgh 22, Pa.

MIXER WANTED

Used Simpson Intensive Sand Mixers, State size, condition and lowest cash price for immediate acceptance. Address: Box 768, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• FOUNDRIES WANTED

WANTED

We would like to purchase gray iron, malleable or steel foundry. Must have sales from 20 to 50 tons per day. Prefer Ohio location, near or around Cleveland. Will consider others. Equipment and building unimportant as long as good sales volume exists. Address: Box 789, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• FOUNDRIES WANTED

GRAY IRON FOUNDRY WANTED

Capable of producing 25 to 50 tons of gray iron per day. This foundry must be located within a 75 mile radius of New York City. Send full details.

BOX 737, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRIES WANTED
FERROUS—NONFERROUS

Production — Jobbing — Captive — Nationwide foundry investment organization. Complete foundry without property will be considered. All replies confidential. PRINCIPALS ONLY.

BOX 770, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY-WANTED-EQUIPMENT
STEEL—GRAY IRON

Foundry investment organization needs used equipment to activate and machinize a large foundry. Complete foundry with or without property will be considered. Please be specific as to price and when inspection can be made. Principals only. All replies confidential.

BOX 709, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

• FOUNDRIES FOR SALE

FOUNDRY FOR SALE

Fully equipped now operating gray iron foundry in western New York State for sale. Located near the New York Power Development. Reason for selling, present owners want to retire.

BOX 742, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

JOBBING FOUNDRY FOR SALE

Gray iron and semi-steel. 10 tons. 30-40 miles from Chicago. Excellent labor supply. Very busy. Selling due to other interests.

BOX 753, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

ALUMINUM AND BRASS FOUNDRY

For sale. Fireproof building 7200 sq. ft. In profitable operation, bluechip customers of long standing. Vicinity of Milwaukee, Wisconsin. Address: Box 741, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• FOR SALE

FOR SALE

Skip Hoist for 27" x 36" American Wheelabrator Tumblast
Reda Reverberatory Furnace 400 lb. G. S.
Fisher Furnace, #600 MNP
Eclipse Reverberatory Furnace Model F2000G
Skip Hoist for 9½ Foot Cupola—complete
Mold Conveyor 268' long
Osborn #405 Rollers
Vibrating Screens
International Rollover RES, Size 15"—6"
Milwaukee 163 Jolt Stripper
Champion JSL 12 Pin Lift, Jolt
Osborn 710J, Pin Lift
Osborn 212J, Jolt Squeezers
Osborn 275J, Jolt Squeezers
SPO 113 Jolt Squeezer
International LSJ, Jolt Squeezer
International PJS, Jolt Squeezer
Milwaukee 104 Jolt Squeezers
Champion JS 10S Jolt Squeezer
Arcade 100S Jolt Squeezer
SPO 506 Jolt Rollover, Pin Lift, Draw
SPO 110 Jolt Squeezer
International Rollover 24-10 G, Portable
International Rollover 30 x 8, no jolt
J & J 610 Rollover, portable
International Pin Lifts
Davenport Pin Lifts
Osborn 559 Pin Lifts
International Type R core rollover, hand
Swing Grinders
Royer Sand Preparators
B & P Preparators
Blystone Sand Mixers
American Sand Cutters, Models M, AM, AA
Porbeck Core Ovens, drawer type
Grinders, ½ hp to 25 hp
Disc Grinders
Ladles, from 50 to 10,000 lb.
Pouring Devices, 500 lb. to 2000 lb.
Gyratory Riddles
Tramrail & Switches
Air Hoists, 1000 lb. to 10,000 lb.
Overhead chain conveyor #458, track, drives
Blowers—Centrifugal—positive—exhaust
17", 20", 28", 36" Stack Fans
Spencer Turbo Compressor, 3600 CFM @ 24 oz., 40 Hp. Motor
AAF Dust Collector, Type D, Size 14, Dry
AAF Dust Collector, Type N, Size 1½, Wet
AAF Dust Collector, No. 40 Air Mat Dust Arrestor
Spencer Centrifugal Dust Collector, Multiple Vacuum Type, 300 CFM, @ 5" of Hg., Vacuum
Turner & Hawes Dust Collector, Atmospheric Dry Filter Non-Automatic Type, Size 2500
Pangborn Dust Collector, Cloth & Screen Type Size 11,000 CFM

FLASKS
ALUMINUM
SLIP AND POP
SIZES FROM 10" x 10" TO 48" x 48"
JACKETS
ALUMINUM AND IRON
STEEL FLASKS
CORE PLATES
TRANSITE—IRON
MANY OTHER ITEMS IN STOCK
SEND US YOUR INQUIRIES
WE BUY—SELL—TRADE

THE HOMAN MACHINERY CO.
1144 HARRISON AVE. MAIN 1-0339
CINCINNATI 14, OHIO

• FOR SALE

SAND BLAST EQUIPMENT
SELL-BUY-TRADE
GUARANTEED MACHINES
TERMS: 3 YEARS TO PAY

$70,000 worth new Pangborn and Wheelabrator parts. Priced 25% less than list.

6' LF-14 Pangborn Table	$2200.00
9' LG-14 Pangborn Table	4500.00
4' LF—Pangborn Table	2500.00
Pangborn 7 GK Barrel	1500.00
Rumelin 8 x 8 Room	1200.00
Pangborn 53 EN2 Hand cabinet	325.00
Pangborn Auto Peening cabinet	1100.00
14 LG5 Pangborn Multi-table 5—5' tables	9000.00
48 x 48 Wheelabrator Tum. w/loader	3500.00
42 x 48 Wheelabrator Tum. w/loader	2750.00
8' Wheelabrator Table Blast	2000.00
6' Wheelabrator Table Room	4800.00
Pressure Tanks, all types	150.00 up
Vapor Blast cabinets	400.00

All types and sizes of Hand Cabinets, Dust Collectors Pressure tanks, Rooms, Horizontal or vertical Tumbling Barrels and additional Sand Blast Equipment too numerous to mention.

DIAMOND SALES, INC.
5654 W. Jefferson
Detroit 9, Michigan
VI-3-6750

FOR SALE

1—Simpson #0 Muller—Style M (never used)
1—Simpson 18" Muller
1—Lancaster Mixer, Model EBG-4
1—Lancaster Mixer, Model EAG-3
1—Ingersoll Rand Air Compressor, Type PRE-2, 24" x 16", 100± pressure with 300 HP Motor
3—Link Belt Roto-Louver Rotary Dryers, Models 207-10, 316-16, and 502-20.

R. GELB & SONS, INC.
U. S. HIGHWAY 22, RAHWAY VALLEY R. R.
UNION, NEW JERSEY

FOR SALE

27" x 36" American Wheelabrator with dust collector. Excellent condition. WELDON STUMP, 4835 CRESTRIDGE, TOLEDO 13, OHIO. Phone TUrner 2-2006.

FOR SALE

Clino Indirect Arc Electric Furnace. 100 lb capacity. Complete with controls—new transformer included. Used 2 months. Will sell for half of our cost. Address: Box 754, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOR SALE

Two Lindberg radiant fired electric furnaces complete with controls 440 V, 50 KW. Address: ALUMINUM MATCH PLATE CORP., 1500 MILITARY ROAD, BUFFALO 17, NEW YORK.

CLASSIFIED ADVERTISING RATES

(Effective Jan. 1, 1960)

POSITION WANTED—Minimum advertisement set solid.

30 words or less $4.00
Additional words ..... 15c each.

ALL OTHERS—Help Wanted, Employment Service, Wanted-To-Buy, Representatives Wanted, For Sale etc. minimum advertisement set solid,

30 words or less $10.00
Additional words ..... 35c each.

NOTE: If replies are to be sent to a box number in care of FOUNDRY, add 8 words to your advertisement for box number and address.

Any advertisement set in all capital letters, add 50% to the above rates.

Classified forms close the 13th of month preceding issue.

FOUNDRY

PENTON BUILDING CLEVELAND 13, OHIO

INCH RATES PER INSERTION

Single Column 2¼" Wide	One Time	Three Times	Six Times	Nine Times	Twelve Times
1 inch	$ 27.75	$ 26.25	$ 24.75	$ 24.00	$ 23.25
2 inches	54.00	51.00	48.00	46.50	45.00
3 inches	78.75	74.25	69.75	67.50	65.25
4 inches	102.00	96.00	90.00	87.00	84.00
5 inches	123.75	116.25	108.75	105.00	101.25
6 inches	144.00	135.00	126.00	121.50	117.00
7 inches	162.75	152.25	141.75	136.50	131.25
8 inches	180.00	168.00	156.00	150.00	144.00
9 inches	195.75	182.25	168.75	162.00	155.25
10 inches (1 col.)	210.00	195.00	180.00	172.50	165.00
15 inches (1/2 page)	303.75	281.25	258.75	247.50	236.25
20 inches (2/3 page)	390.00	360.00	330.00	315.00	300.00
30 inches (1 page)	562.50	517.50	472.50	450.00	427.50

Remittance should accompany advertisement when submitted —Cash Discount 2%, 10 days.

• FOR SALE

BEST BELT BUYS

Heavy duty, unused, 2500-3000 # cover tensile, 16-19 # friction pull. 3 weeks delivery.

4 ply 28 oz. duck:	LIST	SELL
14" — 1/8" x 1/32"	$4.31	$2.42
16" — 1/8" x 1/32"	4.86	2.72
18" — 1/8" x 1/32"	5.40	3.02
18" — 1/8" x 1/16"	5.69	3.19
20" — 1/8" x 1/32"	5.90	3.32
24" — 1/8" x 1/32"	6.95	3.90
24" — 1/8" x 1/16" (5 ply)	8.54	4.78
4 ply 32 oz. duck:		
24" — 1/8" x 1/16"	7.79	4.36
30" — 1/8" x 1/16"	9.58	5.36

Many other sizes. Samples on request. Distributors available.

PALTECH CO.
NEW CANAAN, CONN.
WO 6-4073

FOR SALE

Flasks 52" x 48", 6" cope, 6" drag	$ 50.00
Flasks 52" x 40", 12" over 24"	70.00
Tabor 10" molding machines	85.00
Tabor 10" Jolt pin stripper	300.00
Pangborn EN2 cabinet with dust collector	400.00
Climax wire cutter 3/16" to ½"	135.00
Uniwash dust collector 5600 CFM, Newcomb Detroit, 10 h.p. motor blower	450.00
Magnesium deburring booth, 4 stations, 15 h.p. motor blower	750.00
American sludge-type dust collector 2500 CFM with 5 h.p. motor blower	400.00
Air compressor Schramm, 4 cylinder, air cooled, 210 CFM with International diesel engine	1300.00
Westinghouse 10 h.p. air compressor	600.00

M. ELSTEIN
426 GRAND STREET
JERSEY CITY 2, NEW JERSEY

FOR SALE

Junker Graphite Rod Melting Furnace Model ST302 4 ft. diam. shell approximately 1,000 # capacity, including extra shell and roof ring with all necessary transformer equipment for 13200 volt or 220 volt power.
Excellent condition.

PELTON STEEL CASTING CO.
MILWAUKEE 7, WISCONSIN

FOR SALE

1—American Wheelabrator Tumblast w/loader	$3500.00
2—American Wheelabrator Dust Collectors 3000 CFM	700.00
2—Beardsley Piper Screenerators Model "M"	375.00
1—Clearfield Muller #404—4½ cu. ft.	1650.00
1—Hyster Fork Lift 2000 # capacity	1500.00

PHONE
BELMONT 5-8153
CHICAGO, ILLINOIS

• FOR SALE

FOR SALE

SIMPSON #3 Mullor Unit Drive (completely rebuilt and fully guaranteed).
INTERNATIONAL Jolt Pin-Lift (Like new) 30 x 40 Flask Size Max.
HOUGH Payloader Model HA ½ yd. Rebuilt.
MOULDERS FRIEND 50" Brush w/extra Rebuilt.
AERATOR for #2 SIMPSON—Guaranteed
SPO #110 J Portable—"as-is" or rebuilt.
SANDSLINGERS (6) Tractor-type—reasonable 19 x 4 Heads.

Other good equipment—contact us.
W. O. McMAHON
BOX 5799, HOMEWOOD STATION
BIRMINGHAM 9, ALA.
Phones TRemont 1-2088 or 9-6170

FOR SALE

Wheelabrator Tumblast 48" x 48" Serial No. A-81387 with loader and electrically operated door. New conveyor flights and link assembly. A-1 condition.

WHITEWATER MANUFACTURING COMPANY
WHITEWATER, WISCONSIN

FOR SALE
MOTOR—GENERATORS
TRANSFORMERS
Unused—Rebuilt
WORLD'S LARGEST INVENTORY
ELECTRIC EQUIPMENT COMPANY
Phone station Collect GLenwood 3-6783
P. O. Box 51—Rochester 1, New York

FOR SALE

3—Whiting Coal Pulverizers #15, complete. Used only 2 months. Sell cheap.
15 tons fire grind standard 78% Ferro Manganese.
Oscillating Conveyors—24"—50', 75', 100' long.
Large variety Dust Collectors, Conical Bins, Heat Treating Furnaces.

JOSEPH ADAMS
1700 ORTHODOX ST.
PHILADELPHIA 24, PA.
Phone — JEfferson 3-4296

FOR SALE

1—#40 Beardsley and Piper Speedmuller complete with motor and skip-hoist—recently completely overhauled—for further information call or write:

BETHLEHEM FOUNDRY & MACHINE CO.
225 WEST SECOND ST.
BETHLEHEM, PA.

• FOR SALE

REPAIR AND REBUILDING SERVICE ON ALL PNEUMATIC TOOLS

We try to carry a complete line of "Hard Chrome Rebuilt Tools" at about half the cost of new tools. Before you discard your old tools, why not send them to us for our estimate on the cost of renewing them with our Hard Chrome Process?

CENTRAL PNEUMATIC SERVICE COMPANY
512 LINDEN AVENUE
DAYTON 3, OHIO

FOR SALE

Jeffrey Vibrating Feeder 10' x 12' with 2.5 KW power supply, new 1950

Link Belt Steel Apron Conveyor 20' x 24' with Link Belt Speed Reducer & 5 HP TC motor for use under sand bin

Rockwell Hardness Tester

MEECH FOUNDRY, INC.
9906 MEECH AVENUE
CLEVELAND 5, OHIO
MICHIGAN 1-5550

FOR SALE

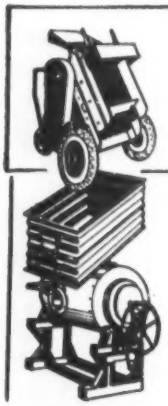
#2½ Modern Cupola-Disassembled and painted —new 1952—50 ft. of stack spark arrestor—used very little.

J. I. CASE CO.
ROCKFORD, ILL.
PHONE WO-33441

FOR SALE

International Core Blower, model SB-13, serial No. 40384, 1941, Clark No. 9697. Name your price. Can be inspected at Buchanan, Michigan plant.

CLARK EQUIPMENT COMPANY
BUCHANAN, MICHIGAN



EUCLID FOUNDRY & MACHINE EQUIPMENT CO.

14919 SARANAC ROAD — CLEVELAND 10, OHIO

WHEELABRATORS
1—20" x 27", 2 cu. ft. Tumblast
1—42" x 48", 17½ cu. ft. Tumblast with loader
1—66" Swingout table
1—4' Tablast w/six aux. tables
1—6' Table Airblast w/six aux. tables

WANTED!
COMPLETE FOUNDRIES, SMALL/LARGE.
PROMPT SERVICE.

MOLDING MACHINES (Automatic)
2—TDA4 Taccones

CORE OVEN
1—Di-Electric, Model CD-25
Coleman, 30 KW.

SWING GRINDERS
10—10 H.P. Mummert-Dixon Model 1814
3—25 H.P. Safety Grinding Wheel Model 204

ELECTRIC FURNACE
1—350 lbs. Detroit Rocking

— GLENVILLE 1-1222

AAA MACHINERY & EQUIPMENT CO.

over 1000 satisfied customers

WORLD'S LARGEST INVENTORY OF GUARANTEED FOUNDRY EQUIPMENT

AIR & ELECTRIC HOISTS

85—I & R Air Motor type, sizes LC3, A, B, C, D, D-6 & E, 300, ½, 1, 2, 3 & 5 ton.
15—DETROIT Air Hoists, 1, 1½, 5ton cap.
2—P&H and DETROIT Model LHR, 5 ton.
20—THOR air hoists, ½, 1 & 2 ton cap.

BUCKET ELEVATORS

12—LINK-BELT & JEFFREY, 30, 40, 50, 60 ft. cc, 10 x 7, 12 x 7, 14 x 7, 16 x 8 buckets.

CUT-OFF MACHINES

1—TABOR C10AF, 16" wheel, 10 HP.
3—TESSEMER H & I Sprue Cutters.

CORE BLOWERS

3—CHAMPION Model CB-10, CB-18, & CB-400. From 10 to 300 lb. Cores.
22—DEMMLER #50 Model 1, 1E, 2, 2E, 2K, 3, 3E, 3K, 4 & 4E. 10 to 100 lb. Cores.
1—FEDERAL 40P-1 San-Blo.
7—INTERNATIONAL Model SB-11 & SB-13, SB-15H, 15 to 30 lb. Cores.
6—OSBORN Nos. 91, 92, 192 and 193. From 10 lb. to 75 lb. Cores.
3—MILWAUKEE #3A Bench Type.
2—REDFORD #2—Magazine type.
1—SAN-BLO Model CB-40-B, 40# Cores.
1—SPO Model SC-10-DM, hollow core.

CORE OVENS

1—INDUSTRIAL "Revolving Carriers" continuous, 18" x 80" trays.
2—PORBECK Batch type 10' L x 8' W x 7' H
1—THERMONIC Model MS00A Dielectric. Cap. 900#s per hour.

CUPOLAS, BLOWERS & EQUIP.

1—SPENCER 150 HP 7500 CFM 48 oz.
6—I & R Centrifugal 30, 50, 85 and 100 HP, 3500 to 10,500 CFM w/blast gates.
1—CUPOLA Bondactor, style 1205-L.

ROTO-CLONES WET TYPE

9—AMERICAN AIR FILTER Type N&W, Sizes No. 20, 24, 27, & No. 30, w/sludge ejectors, cap. to 30,000 CFM.

ELECTRIC MELTING FURNACES

4—DETROIT LFA, 350# Cold Charge 700# Molten w/200 KVA transformers.
1—TOCCO 20 KW Induction, 9600 cycles.
3—AJAX No. 100 & 300 Furnaces Only.
6—AJAX 35 KW Induction 460 V 1 phase w/furnace
1—DETROIT Size CM—4000# Charge, 8000# Molten, w/1000 KVA trans.
2—AJAX 20 KW Hi Frequency Converters.

GAS & OIL FIRED FURNACES

23—LINDBERG FISHER Model MNP electric Tilt. Sizes 150, 400, 600, 1000, 1700, 2000 & 2400#, alum. cap. Gas or Oil.
29—LINDBERG & HAUSFELD Stationary, Sizes 100, 150, 200 & 550 cap.
1—LINDBERG #400 BBI hand tilt.
1—SKLEENAR 1200# Rev., hand tilt.
1—MONARCH 600# Rev., hand tilt.
1—STROMAN, "U" 600# Reverb. Hand Tilt.
1—STROMAN DC "Dipout" 800# cap.
1—ECLIPSE E1000—Double Chamber Dry Hearth 1000# cap.

GRINDERS

Swing Frame

1—FOX #4 Wheel 24" x 3"—20 HP
1—MARSCHKE 20" x 10" wheel, 10 HP.
3—MARSCHKE 24" x 3" wheel, 15 HP.
2—U. S. ELEC. Model 24, wheel 24" x 3".
1—MUMMERT-DIXON #2420, wheel 24" x 3".

Snagging

4—FOX #7—30" x 3" Wheel, 15 HP.
2—U. S. #64, 20" x 3", 7½ HP, 4 speed.
2—SAFETY #174, 24" x 3" wheel, 10 HP.
2—MARSCHKE 24" x 4" wheel, 20 HP.
1—U. S. #65, 30" x 3", 15 HP, 4 Speed
U. S. No. 62VS, 24" wheel, 2-7½ HP motor, variable speed.

Core

2—MILWAUKEE 70-12, 70" dia. table.
1—STONEY Core Grinder, 16" dia. Wheel.

Horizontal Disc

GARDNER No. 124—53" wheel, 20 HP.
GARDNER No. 179, 70" dia. wheel, 40 HP.

LADLES

17—MODERN & WHITING Cylindrical Ladles, 275, 2450, & 3000 lbs. capacity. All Enclosed Gears.
37—MODERN & WHITING Lip Pour, Enclosed Gear, 1200, 1600, 2000, 4000, 6000, 7000, 8000 lbs. capacity.
7—MODERN & WHITING Mixing Ladles, 2 & 3 ton. Electric & Manual Tilting.

MOLDING MACHINES

Jolt Squeezers

12—OSBORN No. 275-J—17x20 Table, 10"
15—OSBORN No. 276-J—17x26 Table, 13"
2—OSBORN No. 216-PJ—21-32 Table, 16"
6—MILWAUKEE 123—17x26 Table, 12"
2—MILWAUKEE 181—24x36 Table, 18"
10—INT. PVJS—20x26 Table, 12" cyl.
9—SPO No. 110-J—17" x 20" Table, 10"
8—SPO No. 113-J—17" x 26" Table, 13"

Plain Jolt

1—J&J 50 x 72 Table—5000# cap.
2—OSBORN 60" x 72" table, 6000# cap.
1—TABOR 36" x 36" table, 1000# cap.

Jolt Rollover Pattern Draw

1—DAVENPORT 28A, 28" x 44" table.
1—DAVENPORT 28-SA, 29" x 40" table.
3—HERMAN 1500 lb. Series, 26" x 48".
1—HERMAN 750 lb. Series, 20" x 30".
2—HERMAN 4000 lb. Series, 40" x 60".
14—INTERNATIONAL TYPE G, Sizes 20" x 8", 24" x 10", and 30" x 8".
2—J&J #612, 24" x 30" Table.
4—J&J #918, 44" x 54" Table.
1—J&J #815-B, 30" x 40" Table.
1—MILWAUKEE #167, 32" x 33" Table.
10—OSBORN #40 and 42 Core Rollovers.
1—OSBORN #442, 21" x 31" Table.
2—OSBORN #242W, 29" x 42" Table.
12—OSBORN #601 & 602, 30" & 36" Wide Flask, 10" draw, 750 lbs Cap.
2—OSBORN 643 Table 35" x 50"—2000#.
1—SPO No. 9546—26" x 32" Table.
1—SPO No. 917-A—40" x 29" Table.
1—SPO #413D, 24" x 25" Table.
1—SPO Model 508, table size 28" x 30".
1—SPO 5050, Table 25" x 30", 10" draw
3—TABOR 30" x 40" Table, 12" Draw.
4—TABOR 22" x 42" table, 10" Draw.

Jolt Pin Lift

3—INTERNATIONAL JDP 1600 x 10" draw, 36" x 36" Table.
2—J & J No. 688 25" x 30" table, 6" draw.
2—MILWAUKEE No. 1030—30x38 Table.
1—MILWAUKEE No. 1536 32x38 Table.
3—MILWAUKEE No. 3548—44x48 Table.
2—OSBORN #559, 25" x 30" table, 7" draw
1—SPO #3058, 22" x 28" table, 8" draw
2—SPO #3070, Table 26" x 35", 10" draw
1—TABOR, 22" x 32" table.

Pin Lift

2—B & P Model AL 2428 Speed Draw.
1—MILWAUKEE #620 ND Push

Jolt Squeeze Pin Lift

1—MILWAUKEE #125, 21" x 27" Table.
3—MILWAUKEE No. 165, 24" x 30" table.
3—MILWAUKEE #196, 17" x 38" Table.
1—OSBORN #712-V, 18" x 26" Table.
2—OSBORN #710-J, 17" x 21" Table.
9—OSBORN 714PJ, 20" x 31" Tables.
1—OSBORN #818—24x36 Table, 18" cyl.
1—MILWAUKEE #246—23¼x42 Table, 24" cyl.
4—INTERNATIONAL PKL, 17" x 26".
2—SPO 2114P, Table 21" x 27", 11" cyl.
2—SPO 2160-R, Table 24" x 30", 16" cyl.

Shell Molding

1—SHALCO, Model HO4, 2 station.

CONVEYORS

Steel Apron

9—JEFFREY & LINK-BELT 24", 30", 36", widths. Lengths built to your specifications, with reducers & motors.

Oscillating & Vibrating

1—HEWITT-ROBBINS 24" x 120'—7½ HP.
1—LINK-BELT 48" x 154', 20 HP Motor.
7—JEFFREY TAYLOR No. 5 Vibrating Feeders 24" wide x 7'.
1—KAYSING IRON WORKS 24" W x 26" L x 6" Deep.
LINK-BELT "FLEXMOUNT"
1—8" W x 50' L x 4" deep pan
2—18" W x 18' L x 4" deep pan
2—SIMPLICITY 24" W x 13' L x 6" Deep.
1—SIMPLICITY 18" W x 11' L x 6" Deep.

Roller

2500' MATHEWS 6", 14" wide, 2-⅞" dia. roller, 1¼" hex shaft, 4" channel.
1500—MATHEWS 8" wide, 3½" dia. 1" hex shaft on 6" centers, 6" channel.

Mold

1—DUO-ROLL 88 Cars 20" x 48", 350' track, with automatic dumping.
1—PALMER "B" 106 Cars—42" x 62" w/550' Track.

Belt

LINK-BELT & JEFFREY 18", 24" & 30" wide. Flat or trough idlers, all Timken bearings. Built to your specifications. Can be equipped with molders hoppers & Ploughs.

HOPPERS & STORAGE BINS

1—NATIONAL ENGINEERING "Moulders Helper" 2 Hopper Unit.
7—NATIONAL & LINK-BELT Storage Bins, 60 to 150 tons cap.
1—NEWAYGO HS-7-GT, Handy Sandy.
42—MOLDERS Hoppers 1½ ton cap.

SAND MULLERS

1—B&P #3½ Mulbaro, 3½ cu. ft.
1—B&P #30 Speedmullor, 4 cu. ft., w/skip Hoist Loader—Air Cooled.
1—B&P #50 Speedmullor, 9 cu. ft., w/skip Hoist Loader—Air Cooled.
1—B&P #60 Speedmullor, 12 cu. ft., w/skip Hoist Loader—Air Cooled.
1—B&P #70 Speedmullor, 18 cu. ft., w/skip Hoist Loader—Air Cooled.
1—BESSER Paddle Type, 30 cu. ft.
1—CINCINNATI 24" muller.
2—CLEARFIELD No. 610 w/skip hoist loaders, 10 to 14 cu ft batch.
1—CLEARFIELD #404, 4 cu. ft. batch
1—DRAVO-DOYLE 6 cu ft cap. Port.
1—LINK-BELT 48" x 8' Paddle Type.
1—PEKAY No. 160-1-24 Mixer Muller, single stage for 24" belt. 230 TPH.
1—SIMPSON #0, style C, 175 lb.
1—SIMPSON #1-H Style UD, 400# batch
2—SIMPSON #1½ style UD, 700# batch w/loader.
2—SIMPSON #2, Style C, 1500# w/loader.
3—SIMPSON #3, Style C, 3000 lb.
3—SIMPSON #3, Style UD, 3000 lb.
2—Mixer Muller, 6 cu ft paddle type.
1—LANCASTER No. EDG-4, 5 cu. ft.
1—LANCASTER #EA-4, 6 cu. ft. w/loader.

SAND PREPARATORS

6—B & P Screeneraters, Models S, M & L.
8—ROYER Models, NC-4, NDS, NDP.
6—AMERICAN Sand Cutters, Model M, Sizes 79/60, 89/70, 99/80. All late.
4—AMERICAN Model AA and AM, 45" & 60" Cutting Blade.
1—AMERICAN "Sand Master," 102"/70" Cutting Blade—1952.
2—MOULDERS' FRIEND 50" & 60" Brush.
2—NEWAYGO RS-V Reddy Sandys.
1—SIMPLICITY LP 2' x 3' screen.

SANDSLINGERS

1—B&P 5-ton capacity Plate Feeder
2—B & P Tractor Type 19" head & 16" head, 13' arms, Magnetic towers.
6—B & P Models DB Stationary Sand Slingers, 16", 19" and 22" heads, with 20, 25, 40 and 50 HP motors. All late.
2—B & P Swing Type Slingers 19" head.
4—B & P 8 ton plate feeders.
2—B & P 35 ton capacity plate feeders.
6—B & P Tanks for speed slingers.
1—B&P Motive 15' Jib—6' Ram—19"—25 HP.
1—B&P Motive Jr. 8' Jib—4' Ram—19"—25 HP.

SHAKEOUTS & SCREENS

2—LINK-BELT 5' x 10', 6 ton cap.
3—SIMPLICITY 4' x 6' Model B.
1—SIMPLICITY 4' x 8' Model D.
1—SIMPLICITY 4' x 10' Model D.
1—SIMPLICITY 5' x 8', Model D.
1—NATIONAL ENG. 5' x 8' Hex Screen.
1—HEWITT-ROBINS 36" x 78" Vibrex.
1—SIMPLICITY 4' x 10' Model B. Single deck sifter screen, 10 HP motors.
2—ROBBINS 3' x 4' JF6—2000#.
1—ROBBINS 6' x 10' JF11—20,000#.

SAND BLAST EQUIPMENT

2—AMERICAN 36" continuous Tumblasts
1—AMERICAN 20" x 27" w/dust collector.
1—AMERICAN 36" x 42", w/skip hoist.
2—AMERICAN 48" x 42", w/skip hoist.
1—AMERICAN 27" x 36", w/skip hoist.
1—AMERICAN 48" x 48", w/skip hoist
1—AMERICAN 48" x 72" w/loader.
1—AMERICAN No. 2 Tablast—6' dia. Plain Table.
1—AMERICAN #3 Tablast, 4—48" tables.
1—PANGBORN Model 6-LF, 6' diameter plain table with dust collector.
1—PANGBORN 6 LG-14 Multi-Table, 6-24" tables, w/dust collector.
1—PANGBORN Model 14GK-7 Roto-Blast barrel w/loader.
1—PANGBORN 9LG-14 Multi-Table w/6—36" dia. Aux. Tables w/Dust Collector.

AAA MACHINERY & EQUIPMENT CO.

10900 CEDAR ROAD—CLEVELAND 6, OHIO—CALL SW 1-3900

UNIVERSAL REBUILT EQUIPMENT GUARANTEED

AIR COMPRESSORS
1—75 hp INGERSOLL-RAND water cooled, horizontal
1—100 hp WORTHINGTON air cooled, 2 stage

AIR HOISTS
10—Thor ⅛ ton, 1 ton, 1½ ton and 2 ton
4—INGERSOLL-RAND ½ ton and 1 ton

BLOWERS
25—CENTRIFUGAL 16 oz., 2 to 5 HP
10—GE, WILBRAHAM - GREEN, FISHER Positive Pressure & Cent. Cupola Blowers

CLEANING EQUIPMENT & TUMBLING BARRELS
1—15" Continuous WHEELABRATOR
1—26" Continuous WHEELABRATOR
1—15" x 20" WHEELABRATOR Tumblast
1—20" x 27" WHEELABRATOR Tumblast
2—27" x 36" WHEELABRATOR Tumblast, one rubber belt, one steel conveyor
1—36" x 42" WHEELABRATOR Tumblast
1—48" x 42" WHEELABRATOR Tumblast,
1—24" WHEELABRATOR Swing Table
1—1-A WHEELABRATOR Multi-table with 6—26" aux. tables, 10—16" aux. tables
1—PANGBORN TABLAST, 8' Table, 2500 #
1—PANGBORN 6'LK Table Room
1—PANGBORN Room, Type 23 "MS," 5' x 2' x 5' table
1—SLY, 68" x 32" Round
4—SLY, 48" x 36" Round

CONVEYORS
1—HEWITT-ROBINS Oscillating, 18" W x 40' L
1—HEWITT-ROBBINS Vibrating, 18" W x 10' L, Model VC-I
1—LINK-BELT Bucket Elevator, 8" x 12" buckets on 14" rubber belt, completely enclosed by 2' x 4" casing.
1—LINK-BELT, CAR type mold, 114 cars, 403' track, car size 18" x 42"
1—SIMPLICITY, 24" x 10" Feeder w/hopper, Model OA-10-JA2

CORE BLOWERS
10—DEMMLER #1, #2, #2A, #3K, #4E
3—INTERNATIONAL 8B-13
3—OSBORN #91, #192, #91-10
1—RANDALL MODEL "A," Bench Type
1—TACCONE #4D, 10" Draw Stroke Cyl.
1—CHAMPION CB-5

CUPOLAS
1—#8 MORRIS w/vertical skip & blower
1—#9 MORRIS—never used
1—SKIP CHARGER for #9 Cupola with scale and buckets
1—WHITING Skip Charger for #5 Cupola
2—#5 WHITING with charger

DUST COLLECTORS
COMPLETE STOCK—both Wet & Bag Type —send us your requirements

FURNACES—DIRECT ARC MELTING
1—250 lb. LECTROMELT, Side Charge
1—500 lb. LECTROMELT, 200 KVA trans.
1—1000 lb. SWINDELL
1—2000 lb. HEROULT
1—2000 lb. SWINDELL, 3/60, 800 KVA
1—1½ Ton HEROULT
1—3 Ton LECTROMELT, Door Charge
1—3 Ton SWINDELL Hyd. Top Charge, 3000 KVA Transformer, Latest Type

FURNACES—INDIRECT ARC
1—10 # DETROIT
1—60 # DETROIT
1—350 # DETROIT LFA
1—750 # DETROIT LPY, Conical Shell,
1—1000 # DETROIT AAD P, 300 KVA
1—3000 # Detroit C, 500 KVA

REBUILT & GUARANTEED

BEARDSLEY & PIPER

#70 Speedmuller

15 cu. ft. batch with Cooling and Skip Loader

FURNACES—INDUCTION MELTING
1—35 KVA AJAX 60 cy., alum.
1—35 KVA, AJAX SPARK GAP, High Freq., steel
1—1250 KW 2 Ton Cap.

FURNACES—GAS & OIL
1—400 # FISHER MNP, Gas Fired, Alum.
1—600 # STROMAN, Gas, "U" Type
1—1 #900 JC STROMAN, gas, Like new
1—1200 # Brass, MNP, Oil

FURNACES—HEAT TREAT
1—4' x 4' x 10' Gas Fired Annealing
1—9' x 12' Car Type, gas/oil
1—20" x 36" L&N Draw electric
1—10" x 24" x 60" Gas, double end doors
1—12" x 36" x 8" high HAYES "Certain Curtain"
1—7' Rotary G.E., 200 KW, 1950° F

MOLDING MACHINES
Jolt Rollover Pattern Draw
1—HERMAN 10,000 #, 48" x 109" table
1—HERMAN 6000 #, 42" x 78"
2—HERMAN 7500 #, 40" x 50" tables
1—HERMAN 7500 #, 40" x 60" table
1—HERMAN 3000 #, 30" x 66" table
5—HERMAN 1500 # to 30" x 48" tables
3—HERMAN 750 #, 24" x 30" tables
1—INTERNATIONAL 30" x 12", Type G, 28" x 35" table
2—INTERNATIONAL, 13" x 17" tables
2—J & J #815RB, 30" x 40" table, 1200 #
1—OSBORN #442, 21" x 31" table, 600 #
1—OSBORN #602, 36" x 26", 900 #
1—OSBORN #405, 3000 #, flask size 64" x 57", 26" draw
1—SPO #506, 24" x 25" table, 600 #
4—TABOR 40" x 60", 1500 & 3000 # capacity
2—TABOR 30" x 40" w/air clamps, 1000 #
1—TABOR 22" x 42", pattern draw, shockless, portable, 600 #
1—TABOR 20" x 30", w/air clamps, 1000 #
2—TABOR 14" x 16" Rockover, 150 #

Plain Jolt
2—DAVENPORT, table 24" x 27", 1200 #
1—INTERNATIONAL, 3' x 4' table, 12" cylinder

Jolt Pin Lift
1—HERMAN #4317, 22" x 30" table
2—INTERNATIONAL JDP, 1200 x 8", 24" x 26" table, 8" draw, 1200 #, port.
1—J & J #681-C, 30" x 25" table, 600 #
1—OSBORN #559, 25" x 30" table, 6" draw, 1200 #
2—SPO #305, 750 lb., 20" x 27" table
1—TABOR 20" x 24" table, 600 #

Jolt Squeeze Pin Lift
2—INTERNATIONAL PKL, 20" x 28" table, 14" sq., 5½" draw
2—INTERNATIONAL PKL, 18" x 24" table, 12" sq., 5½" draw, stat.
1—MILWAUKEE #126, 21" x 27" table, 12" sq., 1200 #, 8" draw
2—MILWAUKEE #163, 15" x 24" table, 11" sq., 1500 #
2—MILWAUKEE #165, 24" x 30" table, 16" squeeze, 1700 #
5—OSBORN #712J, #712PJ, 18" x 28" table, 12" sq., 8" draw, stat. & port.
5—SPO #2114P, 21" x 27" table, 600 #
2—SPO #2116, 21" x 27" table, 11" sq., 6" draw

Jolt Squeezers
2—INTERNATIONAL #12 LJS, 16" x 20" table
4—INTERNATIONAL #10 LJS, 16" x 20"
1—NICHOLS #12 F-P, portable, 600 #
2—OSBORN #276J, 17" x 26" table, 13" squeeze, 500 # port.
12—SPO #110J, 17" x 20" table port.
1—SPO #113 J, 18½" x 26" table, 13" cyl port.
10—OSBORN #275J, 16" x 20" table, 400 # port.
3—TABOR Squeeze-in Head, 16" x 19" tabie

MATERIALS HANDLING
1—BYERS, Mobile Crane, BUDA Engine, 50' Boom, 5 ton w/magnet & bucket
1—HOUGH PAYLOADER, Model HA, 1000 # cap., hyd. lift, mech. dump

MULLERS AND MIXERS
1—B&P #30 Speedmuller w/skip hoist, 3 cu. ft. batch
1—B&P #40 Speedmuller w/skip hoist, 5 cu. ft. batch
1—B & P #70 Speedmullor, 15 cu ft batch with cooling and skip loader
1—B & P, Conventional, SIMPSON type, 87½" Dia. arranged for cooling
1—CLEARFIELD #404, 4' Dia, 4 cu ft batch
1—CLEARFIELD #610, 6' Dia., 10-14 cu. ft. batch
1—SIMPSON #0, U.D. 3' Dia, never used
1—SIMPSON #1, U.D., 4' dia., 4 cu. ft. batch
1—SIMPSON #2, 6' U.D. Dia, 14 cu ft batch
1—SIMPSON #3, 8' Dia. Open Gear, 20-25 cu ft batch
1—SIMPSON #1½, U.D., 6 cu. ft. batch
2—SIMPSON #3, enc. gear, 20-25 cu. ft. batch

LADLES
Bottom Pour
4—MODERN, 49" x 49"
2—MODERN Crane Type, 55" H x 50" top
1—MODERN Crane Type, 60" H x 60" top

Lip Pour
1—WHITING 40" x 40" top dia. geared

Cylindrical
8—WHITING, 26" L x 25" dia, 1100 # iron
7—WHITING, 19" L x 22" dia, 600 # iron
3—WHITING, 38" L x 28" dia, 2200 # iron

OVENS
1—COLEMAN, Gas, 2 Comp. and 5 drawers, O.D. 22" x 12' x 10'
1—GENRICH, Elec., 3 drawer, preheating, auto-control, 9' H x 8' W x 6'7" L
1—GENRICH Electric, Rack Type, 5' W x 7' H x 5'3" L
3—GENRICH, Gas, elevator type, Inspection under operation in N.Y.C.—Excellent Condition

SAND CONDITIONING
1—AMERICAN Sand Cutter, Model AA, size 72
1—B & P Nite-Gang
2—B & P Screenarator, Model "S" & "M"
1—LINK-BELT Revivifier
2—ROYER, NC-2, 10-15 tons/hr, 1½ HP
1—ROYER PREPARATOR, Comb. Model NDC, 25 ton/hr scrap removal, 8' x 8' hopper
3—ROYERS, NDP, 15-25 tons/hr, 2 Hp
1—SIMPLICITY Type SOBG, 4' x 5' screen

SAND SLINGERS
1—B&P Stationary, Single Speed
2—B&P Tractor Type, 16" head
2—B&P Tractor Type, 19" head

TESTING EQUIPMENT
1—500,000 lb. TINIUS OLSEN Hydraulic Compression Testing Machine
BRINNEL Hardness Testers, Manual & Motorized
1—10,000 # BALDWIN-UNIVERSAL

MISCELLANEOUS
1—BONDACTOR Cupola Gun
1—HOWE WEIGHTOGRAPH SCALE, Model 1700
1—KANE & ROACH WIRE STRAIGHTENER, Model DX-5
FLASKS, CORE PLATES, All Sizes
1—CLIMAX Model 2-A Wire Straightener
10 or 15 HP GRINDERS, Swing Frame
8—GRINDERS, Double End, Pedestal Type, U. S., Cin., Gardner, 5, 7½ & 10 HP

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AERATOR
NEWAYGO

BELTING
29" x 180' 24" x 152'
24" x 263' 24" x 120'

BLOWERS
GE 10500 cfm., 20 oz., 85 hp., 220 V.
GE 7500 cfm., 20 oz., 89.6 hp., 220-440 V.
GE Centrifugal 6200 cfm., 24 oz., 58 hp. motor
SPENCER 7350 cfm., 16 oz., 50 hp.
SPENCER 2250 cfm., 16 oz., 15 hp., 220 V.
Ingersoll-Rand 12900 cfm, 100 h.p. 220-440V, 20 oz.
McKee 200 cfm
North American 850 cfm.
NORTH AMERICAN 1050 cfm., 16 oz.

BUFFERS
6—HAMMOND VROL 3 hp variable speed
HAMMOND 5-VRO 5 hp variable speed
STANDARD 20 RSB 20 h.p.
MARSCHKE Roto-Mat 6 Station

CLEANING EQUIPMENT
Model 4836V-B VAPOR BLAST
VACU-BLAST C9-D5

CONVEYOR OVERHEAD CHAIN
1400' JERVIS B. WEBB and LINK-BELT #678 with trolleys 36" centers. 2-5 hp. Variable speed caterpillar drives, take-ups and turns.

CONVEYOR
17' BARBER GREEN Bucket Conveyor
30" x 25' Magnetic Belt Conveyor w/drives, 2 hp., 220-440 V.

CORE BLOWERS
CHAMPION CB15 55# cores
CHAMPION CB10 12# cores
DEMMLER #2, 20# cores
DEMMLER #2K, 20# cores
REDFORD Bench types, horizontal or vertical clamping
CB15 55# cores, Universal blow plate
DEMMLER #4 up to 250# cores
FEDERAL "SAN-BLO" CB 40
INTERNATIONAL SB15H, up to 150# cores. Hydraulic clamp and draw
INTERNATIONAL SB 13, up to 60# cores
INTERNATIONAL SB 12, medium sized cores
INTERNATIONAL SB 11, medium sized cores
6—OSBORN 193 up to 50# cores
OSBORN 2035-2 large sized cores

CORE GRINDERS
5—MILWAUKEE 70-9 & 70-12s
1—OWOSSO DE1-303 42" table

CORE OVENS
THERMONIC INDUCTION MODEL 1800A
5—DESPATCH, Gas Fired, 3 Drawer
DESPATCH Gas Fired, walk in 7' x 7'

CORE ROLLOVERS
INTERNATIONAL REDP Rollover 12" draw

CRANES
P&H 3 TON Electric Traveling DC motors 50' span
270' Crane Runway and Supports
10 ton MILWAUKEE; 48' span, 220 V.

CUPOLA GUNS
1—BONDACTOR #1250
BONDACTOR #1000

DUST COLLECTORS
PARSONS 40,000 cfm. cloth bag type
ROTOCLONE, Size 6, Wet Type, 3000 cfm
ROTOCLONE N-15 h.p. 6600 cfm
ROTOCLONE W14 Arrang. A, 5200 cfm.

ELECTRIC MELTING FURNACES
SINGLE PHASE
1—DETROIT "LFA" 350# shell 13200 V.
1—DETROIT "LFC" 700# & 350# Tapered Shell 2300 V.
30 KW Lepel

FLASK HOIST—ROLLER CONVEYOR
NATIONAL 24"; 8' long table

FURNACE TRANSFORMERS
1—"LECTROMELT" 800 KVA, 12000 V., 3 phase
PENNSYLVANIA 750 KVA, 13200 V., Single Phase
1—WESTINGHOUSE 500 KVA, 11200 V., 3 phase
1—WESTINGHOUSE 2500 KVA, 13800 V., 3 phase

FURNACES NONFERROUS
CAMPBELL HAUSFELD Staty. pot type
1—HEVI-DUTY HD-181-S Pot type, Electric
2—400# FISHER Gas Fired Tilting Furnaces
1—600# FISHER Gas Fired Stationary Furnace
1—CAMPBELL HAUSFELD Oil Fired 625# brass hand tilt
1000# STROMAN DC double dipout w/complete controls

GRINDERS, SWING FRAME
MARSCHKE 24" x 3" x 12" 20 hp., 220 V.
U.S. 24" x 3" x 12" 15 hp., 220-440 V.
2—MARSCHKE 3 hp., 12" wheel
1—B&D 7½ hp.

GRINDERS, MISC.
U.S. #70 Combination 20" disc and 20" x 3" x 1½" wheel
GARDNER 18" single end disc.
HANCHETT 30" double spindle opposed
GARDNER 26" D.E. Disc.
GARDNER 30" D.E. Disc.

HEAT TREATING FURNACES
HOLDEN #202 Electrode Type. Bright hardening annealing 1850°
LINDBERG 48" x 48" x 72" Elec., 1250°, box type.

HOISTS
10 ton SHAW BOX electric hoist
4—INGERSOLL-RAND Air trolleys
1—500# INGERSOLL-RAND LC-4
4—CLEVELAND 2000# Cab type hot metal carriers

LADLE MIXING
4000# Industrial, Insulated

MOLD BLOWER
TACCONE TD4 24" x 32" flask

MOLDING MACHINES
JOLT SQUEEZE PIN LIFT
2—OSBORN 712 PJ 18" x 28" table
1—CHAMPION JSL10P 18" x 21" table 6" draw
2—#2114G SPO table, 20" x 27"-11" cyl.
2—OSBORN 712 PV

SPECIAL! FACTORY REBUILDING
8—MILWAUKEE 2646 Jolt Squeeze Strip rolloff — rolling molding machines 10" jolt cylinder; 1800# capacity, 26" Squeeze cylinder; 13" draw, Flask size 25½" to 29" wide, 52" long. New 1951. WILL BE FACTORY REBUILT.

JOLT SQUEEZERS
4—CHAMPION, JS10P 18" x 21" table
2—OSBORN 275PJ
2—MILWAUKEE 244 Jolt Squeeze car type head
MILWAUKEE 181-7, 24" x 36" table

JOLT ROLLOVER DRAWS
HERMAN 10000# late
HARMAN 3000#
2—750# HERMAN 20" x 30" table
1—INTERNATIONAL RJ 20" x 12"
3—SPO 9032

JOLT SQUEEZE ROLLOVER DRAW
2—#331 OSBORN 24" x 30" flask area, 7" draw

JOLT PIN LIFTS
2—INTERNATIONAL 1200-8 26" x 27" table, 8" draw

PIN LIFT PUSHOFF
MILWAUKEE 620ND 20" x 24" table

PLAIN JOLT
40" x 84" Herman
36" x 60" Herman

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2—#3 UD Simpson
1—930 Clearfield
1—#1 Simpson Muller
B & P #30 w-skip loader; multrol heating, cooling blower.

B & P #30 w/skip multrol, also has cooling or heating coils for plastic or shell.

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AMERICAN 51"
JEFFREY SANDITIONER

SAND SLINGERS
1—B&P Tractor, 19" heads
B & P Stationary 16" single speed
B & P Stationary 19", 5" tip 2 speed

SAND SYSTEMS
2—NEWAYGO SUPER HANDY SANDY; like new

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30" LAIDLAW, Metal Cutting hydraulic feed
42" TANNEWITZ, 5 hp., 220-440 V.

SAWS, CUTOFF
DELTA Abrasive cutoff

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3' x 5' ROBBINS
3' x 5' SIMPLICITY
5' x 6' SIMPLICITY
4' x 10' SIMPLICITY
3' x 10" SIMPLICITY

SHELL EQUIPMENT
SHELL PRODUCTS 20" x 30" pattern size w/shell blender and bonding press

SHOT BLAST
SLY #4, 20" x 30" w/dust collector

SPRUE CUTTERS
2—PERKINS #53 1¼" stroke
1—MILWAUKEE #85 TON

STRAIGHTENING PRESS HYDRAULIC
150 ton HPM
150 ton Farquhar "C" Frame
100 ton Watson Stillman "C" Frame
60 ton Lempco 4 post
60 ton Farquhar "C" Frame

TESTING EQUIPMENT
ARLIN Automatic Rockwell, continuous type
COLEMAN 55 Spectrophotometer
GOGAN Model 1414-2V
TYLER ROTAP Testing Sieve w/screens
TINIUS OLSON Brinnel Hardness Tester Production
TINIUS OLSON Brinnel Hardness Tester Bench

TUMBLING BARRELS
1—ROYERSFORD, 42" x 72", chain drive, late
WHITING 60" x 72" 20 hp. drive
SLY, 24" x 42"; 3 H.P.

WHEELABRATORS
27" x 36" American w/skip
48" x 48" American Gun type Cabinet
2—20" x 27" AMERICAN w/rubber belt
AMERICAN #1A Tablast, S/N 64850
1—42" x 48" AMERICAN Skip Loader
AMERICAN #2 Tablast S 28" tables, late
2—HOLLINGSWORTH 44" x 48" Wheelabrators

WOODWORKING—PATTERNSHOP
GARDNER 30" DISC and Spindle Sander
HERMANCE 24" Planer
JONES SUPERIOR 48" Double Disc
BOICE CRANE 12" Planer
OLIVER #290 Dbl. Arbor, Tilt-Arbor Saw
1—OLIVER 182D, 15" Disc Sanders
WALLACE 8" Jointer
CRESCENT 24" Planer
TANNEWITZ 42" Band Saw
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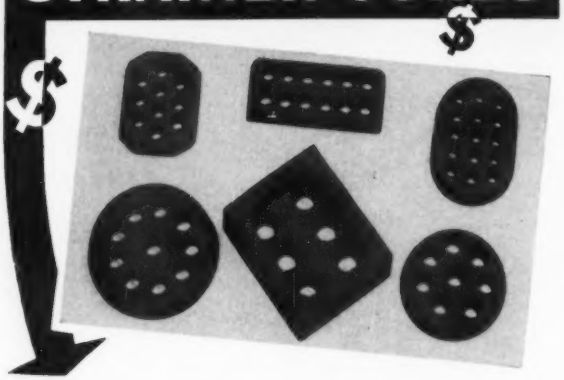

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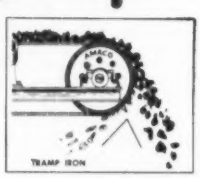

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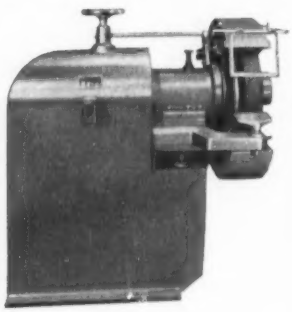

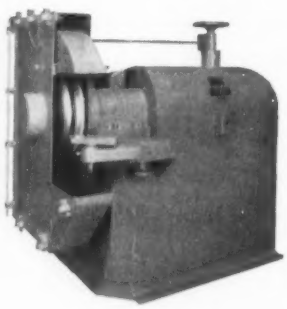

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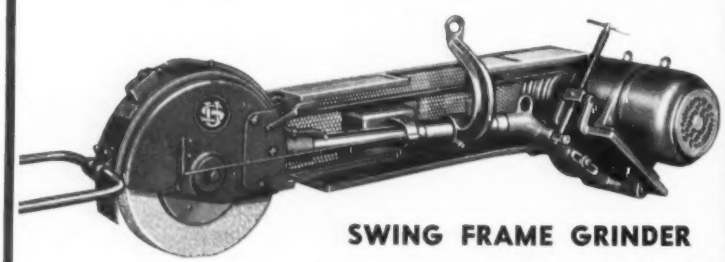

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A-5792-1/A R

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poured the MODERN *ONE-MAN way!*

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Whether your nonferrous metal is melted in crucibles in their pit furnaces or in tilting gas fired and electric furnaces there's a one-best, ***ONE-MAN*** system available for your use. MODERN engineers welcome the opportunity to plan along with you.

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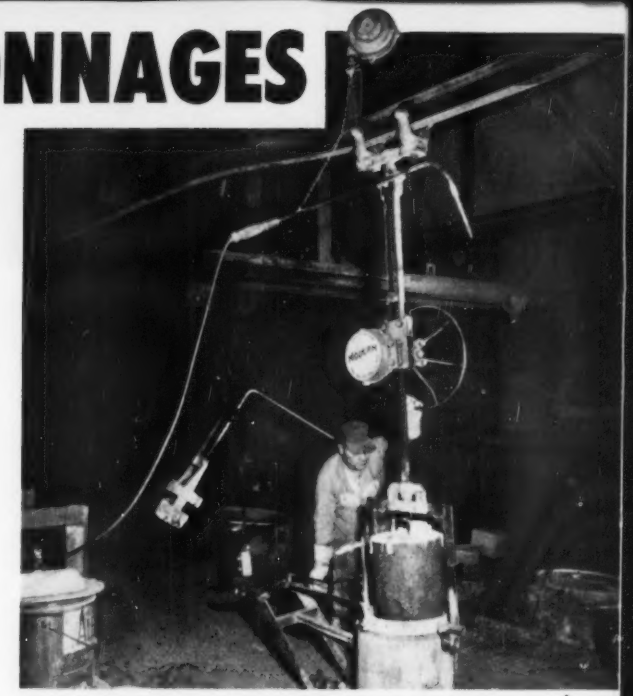
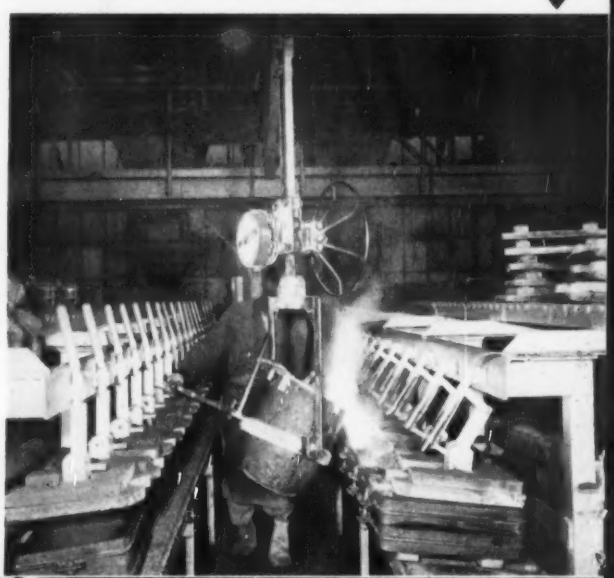
MODERN

MODERN EQUIPMENT COMPANY
Dept. F-11
Port Washington, Wisconsin



Number 100, 330 lb. capacity crucible is hoisted by tongs from the pit furnace and lowered into position in the shank ring on crucible-holding stand at Lincoln Brass Works, Detroit. Detachable bail on the MODERN "F" type Pouring Device lifts the shank, crucible and molten brass for *ONE-MAN* pouring on conveyor line.



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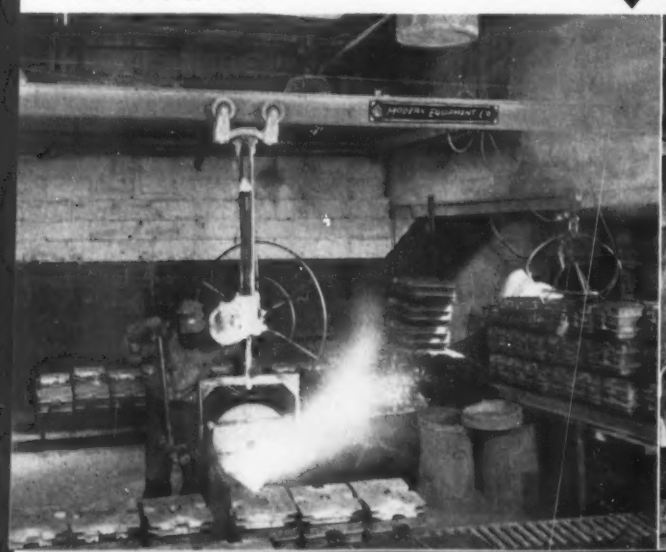

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HIGH TENSILE STRENGTH – no weakening when set in molds for long intervals. Pasted assemblies will hold fast even when dipped in core wash.

FASTICK LIQUID CORE PASTE

SPEEDS PRODUCTION – dries fast in air or oven. Comes ready to use . . . flows freely and smoothly . . . remains homogeneous in storage.

ECONOMICAL AND VERSATILE – only a light application is needed . . . is highly effective in pasting resin bonded cores and shell molds . . . no clamps needed.

UNIQUE QUALITIES – less gas volume than conventional core pastes . . . cannot ferment . . . impervious to moisture.

We would like to prove our claims. Let us make a trial run in your plant. Phone or write to:

frederic b. **STEVENS, inc.**

DETROIT 16, MICH.

BUFFALO CHICAGO DETROIT CLEVELAND
INDIANAPOLIS MILWAUKEE NEW HAVEN SPRINGFIELD (OHIO)

Circle 552 on Page 53

EVERYTHING FOR A FOUNDRY

Increase output and cut castings costs

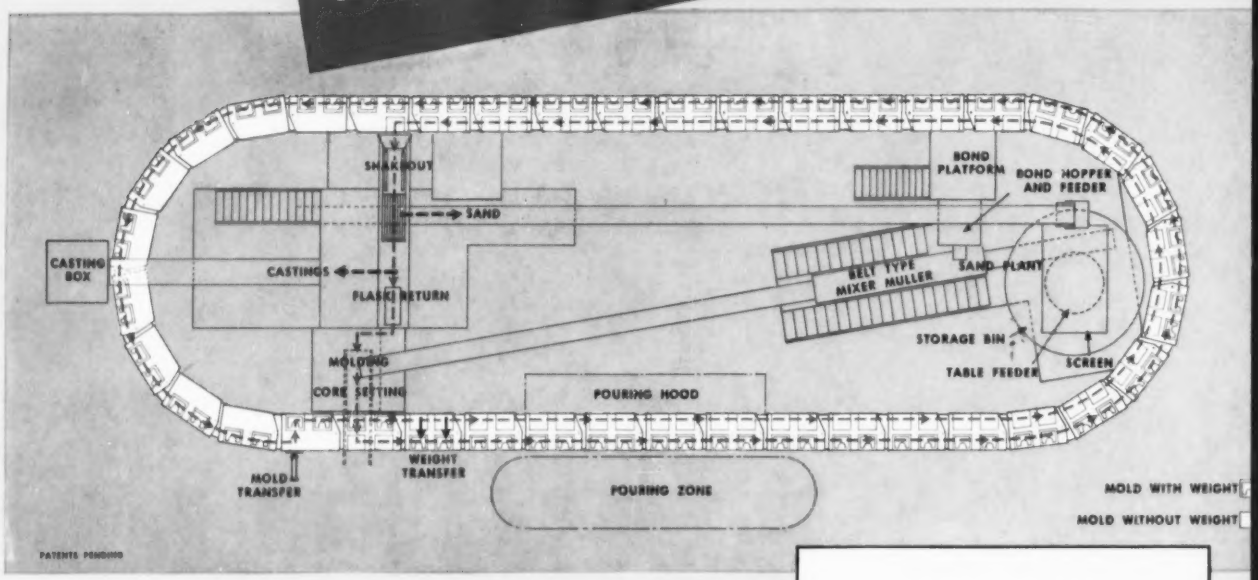
with

BARTLETT-SNOW CLEVELAND 5, OHIO

NEW

Double "MC" (CONTINUOUS TYPE)

MOLDING SYSTEM



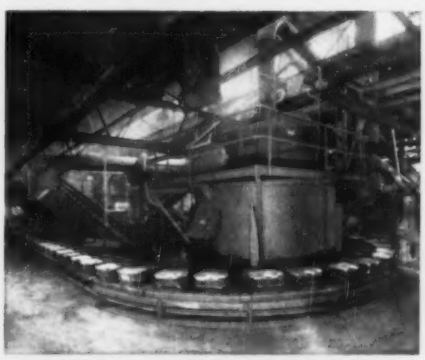
New type system offers many advantages

1. The side by side loading of molds on the conveyor provides nearly twice the cooling time as a conventional mold conveyor—or conversely—the same cooling time, with a loop only half as long.
2. All molds are poured from outside the loop.
3. The mold cars can be of any size. The system can be adapted to handle any size mold—with any metal poured.
4. The layout is extremely compact. There is no wasted floor area. A minimum of foundations and pits are required.
5. All equipment including sand plant, flask return and molding machine is located inside the loop.

● **For more information about this new system, and other cost reducing ideas for your foundry, telephone your nearest Bartlett-Snow representative.**

OPERATION

The RED ARROWS in the above diagram show the unique path of the molds through weight transfer, pouring and cooling to shakeout.



THE C. O. BARTLETT & SNOW COMPANY

Designers, Engineers, Fabricators and Erectors of Foundry Equipment

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